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Annual Report

of the

Department of Agriculture in the Bombay Presidency

For the Year 1926-27

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1926-27

The year 1926-27 has been noteworthy in the record of the Department of Agriculture in the Bombay Presidency on account of two outstanding events—the first Presidency Agricultural Show held in Poona in October 1926, and the visit of the Royal Commission on Agriculture, which visited the Bombay Presidency on two occasions, first in October 1926 and secondly in February 1927. I will give some account of these events before entering on the record of the ordinary work of the Department of Agriculture.

The first Presidency Agricultural Show was held at the suggestion of His Excellency Sir Leslie O. Wilson, Governor of Bombay, who called a meeting at Government House, Poona, towards the end of 1925 to consider the matter. The idea of such a show, on an unprecedented scale, was taken up with enthusiasm by the Chiefs, Sardars, and people of the country, by the merchants of Bombay, and by almost every other section of the population. An amount of Rs. 1,38,294 was subscribed, to which Government added Rs. 50,000, thus ensuring an adequate representation of the crops, the agricultural activities and the livestock of the Presidency, and their possible improvement. The organisation was entrusted to a Committee with the Commissioner, Central Division (Mr. G. W. Hatch, I.C.S.) as Chairman, and Mr. T. F. Main, B.Sc., Deputy Director of Agriculture, S. C. D., as Secretary. On this Committee worked officials and non-officials, Chiefs, Sardars, and other gentlemen, and the result was that the Agricultural College, Poona, and its grounds, where the Show was held, was transformed for ten days into a centre where large bodies of people from almost every corner of the Presidency were found, and which has already excited an influence far beyond what was anticipated by the greater proportion of the promoters. The total attendance was 201,116, and though the labour it entailed on the members of the Department of Agriculture and other Co-operating Departments (Co-operative, Public Health, Veterinary, Industries, etc.) as well as on the very large number of non official helpers was very great, the result was well worth while, and it is hoped that it will be only the first of a series of such shows on something like the same scale and exerting the same influence. It has been proposed to hold the next Show at Ahmedabad.

When the Presidency Agricultural Show was actually in progress, the Royal Commission on Agriculture arrived in the Bombay Presidency, and held their first sittings in Poona, where they spent a considerable amount of time in the Show itself. They also examined a number of witnesses in Poona and Bombay. I was myself under examination for nearly three days, and most of the leading members of the Department of Agriculture, as well as representatives of the Revenue, Irrigation, Co-operative, Public Health, and Veterinary Departments were examined at length. The Commission returned in February after travelling in other parts of India. They paid a short visit to Upper Sind, and then came to Bombay and examined further witnesses in Bombay, before intermitting their labours by a visit to Europe.

Agricultural Conditions of the Year

The year 1926-27 was, on the whole, a fairly favourable one. No doubt, there were adverse factors such as the excess of *kharif* rains in Gujarat and Khandesh, the deficiency of late rains over most of the Presidency, the frequent visits of locusts in North Gujarat etc. etc. which caused considerable anxiety at times but with all these draw-backs the *kharif* crops were fairly satisfactory over most of the Presidency while the *rabi* crops also were on the whole good in most of Gujarat and Khandesh. In fact, except in the south-east of the Presidency, where the *rabi* crops were definitely bad, the season under review may be said to have been favourable over a large part of the Bombay Presidency. In Sind grave anxiety was felt at the outset as the inundation was much below normal in June but from the end of this month the river attained its normal level and thence forward maintained its position well with the result that the *kharif* crops were generally good. The *rabi* crops had a good start and though they suffered later on from frequent visitations of locusts their yield was, in most parts, not far below average.

The prices of agricultural produce were almost stationary. or if any thing showed a downward tendency and the fall was especially marked in the case of cotton and *gul*. On the other hand, wages were either the same as last year or showed a rise in places. The result was that while for the classes labouring for cash wages it was a good year, it was definitely a bad one for the large cultivators chiefly cultivating by employed labour. Thus, for example, in the Deccan Canal Tracts which depend chiefly on sugar cane and in the cotton areas, the year under

review has been a very unsatisfactory year as compared with those to which the people have been accustomed in the past.

Agricultural Improvements Developed in 1927

In previous reports, I have considered in detail the main items of agricultural improvement which have been worked out and are being pushed by the Department of Agriculture. There is no need to repeat this, and I may confine my attention this year to the progress made with these and other items during the year under report.

Groundnut Cultivation.—I may note again the continued increase in the popularity of groundnuts as a crop, based as it is on the introduction of the small, high oil-bearing types by the Agricultural Department. The following table shows the figures for the advance in area.

Groundnut area

Years	Total area Acres	Khandesh Acres	Upper Gujarat Acres
1912-13	181,161	4,119	395
1924-25	344,401	140,190	39,151
1925-26	595,588	297,211	75,875
1926-27	602,407	239,267	76,824

The continuance of this progress depends on the maintenance of the purity of the types grown in each area. There has been a certain amount of admixture in Khandesh, and this would ruin the market. Groundnut seed of known purity is available through the Agricultural Department, and in certain areas (notably Dharwar) high yielding and high oil-bearing strains are being developed. Every propaganda measure we know is being used in Khandesh in particular, to ensure that the types grown are kept pure.

Rice.—The high yielding strain of Kolamba rice (No. 42) which has been developed at Karjat for the North Konkan is now popular and its growth is being rapidly extended. The plan is to give out fresh seed, known to be pure, for 10,000 acres a year and though this quantity has not been reached, a very substantial proportion of that area is being supplied each year. Another Karjat selection (Kolamba No. 79) has again proved its suitability in the Ratnagiri District, and arrangements have been made for its multiplication on a large scale.

Selection and breeding work at Ratnagiri for the South Konkan, and at Mugad near Dharwar, for the up-ghat area of the Karnatak is not so advanced, but in both cases selections

of great promise have been evolved and are now being tested on cultivators' fields previous to development on a large scale.

In Sind, selection and breeding work with Upper Sind rices has been very successful, and types of "Kangni" "Prong" and "Jajai" rices, yielding twenty per cent. increase of crop or more are now available for distribution on a moderate scale. The demand for these improved varieties is now very keen.

Other lines of development in rice cultivation are chiefly in the direction of manuring. The substitution on rice seed-beds of the "*rab*" method of burning the land, by a dressing of Sulphate of Ammonia has been a great success, and, wherever the collection of materials for *rab* burning is difficult, bids fair to replace the latter method. Considerable extension in this direction is taking place, for instance, in the Igatpuri taluka of Nasik.

With the fall in the price of artificial manures, it has become possible to use these profitably for rice, and the extension of their use is being pushed. The quantity of sulphate of ammonia which can be profitably used in the North Konkan in the field manuring of rice is much higher than was thought, and quantities up to 300 lbs. per acre have proved profitable. The future of manuring rice with this fertiliser seems assured. On the laterite soils of the South Konkan and Kanara, the situation is different, but bonemeal has given good results, and there is a small but steady demand. It would be much greater if the money to purchase it were more easily available.

Cotton.—The improvement of cotton has always been one of the chief items of work of the Agricultural Department, and progress has been made in the year under report in every division.

In Gujarat, the type of Broach cotton known as "1027 A.L.F." has now become the standard in all the areas south of the Nerbudda, and I think represents the high water mark, as regards staple of Asiatic cottons. Nothing better in staple than this has been found, but success has been now achieved in obtaining a cotton, of fixed type, by crossing, which has the same staple and a considerably higher ginning percentage. This is known as "No. 5" and is now being multiplied for distribution in the Surat area. This will now take the place of part of the supply of pure seed for over 100,000 acres which is now arranged for each year by the Agricultural Department.

The preliminary success which I noticed in my last year's report with a new cotton known as Broach 1A-9 for the areas

north of the Nerbudda, has been confirmed with the cotton grown on large scale. This cotton has a staple equal to Surat cotton and a ginning percentage equal to that now grown in the tract in question. It is now being multiplied, and in two or three years enough will be available to form a distinct factor in the cotton cultivation in this area.

In Upper Gujarat the extension of the new strains of "Wagad" cotton obtained by selection, proceeds slowly but if famine or floods do not intervene the multiplication of these new strains will now proceed normally. They are already in demand.

In Khandesh, apart from the N. R. cotton distributed by the Agricultural Department and which has become the standard cotton of the tract, the cotton breeder has now isolated two types which seem in all respects better than this, and one of them, known as Dhulia No. 1 is now being grown on a large scale. Under test by the Indian Central Cotton Committee during the year it has been shown to spin 20's as against the N. R. cotton which spins 10's to 12's, while it is as good in point of yield and ginning percentage. We seem to be on the eve of as big an advance in the quality of Khandesh cotton as has been produced in Surat or in the Karnatak.

In the Karnatak, the distribution of improved cotton seed on a very large scale has continued, in co-operation with the Hubli and Gadag Co-operative Sale Societies. Two further problems have engaged specially the attention of our research workers—namely the breeding of a wilt resistant cotton for the Kumpta tract, and the production of a longer staple cotton suitable for the Dharwar American tract. In both cases success seems to have been reached, and types have been fixed with the desired qualities. In the first case success has been achieved by crossing two strains of Kumpta cotton, and in the latter by crossing the Upland cotton of Dharwar (Gadag No. 1) with a strain of Sea Island cotton. It now remains to multiply seed of the types obtained and test it on a large scale.

In Sind, American cotton growing has received a set-back in the year under report, owing to the low prices for staple cottons and also owing to an unaccountable failure in the Punjab American cottons (particularly the so-called F. 4). The area reached 30,000 acres, but as a result will probably be much less in 1927. Our standard cottons for distribution, namely 27 W.N. for *deshi* types and Punjab F. 4 for American types, are, however, strongly in demand, particularly the former, and it is, with all our efforts, impossible completely to meet the demand.

Research is now being concentrated on the investigation of types suited to the conditions which will prevail after the Sukkur Barrage is established. There is decided promise in certain Egyptian cottons, notably Ashmonni, an Upper Egyptian type, and in certain imported Americans (though in very few of these) that known as '*Acala*' has given us excellent results. One curious point seems to have emerged from these tests with Egyptian and American types, namely that it is possible, in Central Sind at any rate, to sow too early, and that all flowers which open before the middle of August fail to produce bolls.

Wheat.—The biggest success with wheat has been obtained in Sind, where the Pusa 12 type introduced into Northern Sind has now become the standard type in the country, the zemindars being, on the whole, now enthusiastic about it even under *bosi* conditions. The strains of local wheat (Phundani C.P.H. 27 and Thori A.T. 38) isolated by the Agricultural Department and referred to in the last report have again proved their superiority even to the Pusa wheat and are now being spread on a large scale.

The work on improvement of wheats in the Deccan has been disappointing, though a number of strains have been isolated which give a bigger yield than the local wheats. But there do not seem to be strains developed or introduced, which can be recommended on the very large scale that is the case with other crops.

Tobacco.—I referred last year to the great success of a new tobacco (selection No. 6 from *Gandiu*) in the tobacco growing regions of Gujarat. This success has been emphasised in the current year, when the demand for seed has been phenomenal, as would be expected when it is realised that it gives, in irrigated tobacco, an *extra* value of Rs. 50 per acre. A scheme of multiplication of the seed for supply has now been worked out, and large quantities will be available in future. Fresh selections from the *Piliu* and other types have been made, and systematic crossing between American and local types are being made for flavour and higher yield.

The chance of increasing yield by manures without deterioration of quality has been investigated for a number of years,—and results have now been obtained which are being pushed in the tobacco areas.

Jowar.—The improvement of this, the premier grain crop in the Bombay Presidency, is now an accomplished fact in three different centres in the case of *kharif jowar*. The seed

given out at Dharwar, yielding from 12 to 24 per cent. more than the corresponding local types, is now becoming popular and is in demand. Its extension is only limited by the facilities for multiplication and of organisation of distribution when the seed is multiplied. The position at Surat is a little more doubtful, but the *Althan-deshi* seed, giving normally an increased yield of about 200 lbs. per acre of grain more than the corresponding local type is affected by the variation of the seasons there. This affects some types more than others. The seed is however in demand. The work in Sind, is now carried on both at Larkana and at Sakrand. New types are being, as stated in last year's report, given out for multiplication at the former centre. At the latter centre the prospects are still better, and some of the pure strains isolated there are remarkably promising.

The improvement of *rabi jowar* has made less progress. The work at Broach has continued, and higher yielding strains are being given out, but it has not been possible even yet, to undertake the improvement of *jowar* in the great *rabi jowar* growing areas in the east and south east of the Deccan.

Other Crops.—The improved strains of *nachani* (Eleusine *Corocana*) developed at Hatkamba (Ratnagiri) continue to do well, and the multiplication and distribution of one of these (E. 31) has become one of the ordinary pieces of work of the Agricultural Department. A beginning has been made in Sind in 1927 on the study of *guvar* (*Cyamopsis psoraliodies*), the most important *kharif* pulse in that province.

Thus far an account has been given of investigations into crops which are financed from the budget of the Agricultural Department, other schemes for the improvement of crops have again been financed by the Indian Central Cotton Committee and by the Sir Sassoon David Trustees, and the progress during the year with these is recorded below.

1. *Study of Cotton Boll shedding at Surat.*—This work has now been in progress for four years, and the grants of Rs. 25,000 per annum for it have been again paid. It is an attempt to find out the reason for the enormous loss of buds and bolls formed on the cotton plant, for usually less than 20 per cent. of the flower buds formed ultimately produce bolls, while the proportion is often below 10 per cent. The work in the year under report has confirmed the position that strains of cotton can be developed where the boll-shedding will be small, and the obtaining of pure strains of this character (which is a slow business) is now fully under way. The other method of attack

by regulation of the moisture in the soil in the latter part of the season is also likely to be successful. At present the possibility of doing this practically seems to lie in the burial of green manure between the rows, when the layer containing this retains moisture better than the ordinary soil, and the plants give a percentage of boll-success far higher than the ordinary plants. The Indian Central Cotton Committee research sub-committee have approved the progress made at their meeting in January 1927.

2. *Study of the spotted boll-worm of Cotton at Surat.*—A grant of Rs. 15,000, now raised to Rs. 18,000 per annum, is made by the Indian Central Cotton Committee for this work and it has been continued in the present season. The line of work now being followed chiefly is that of the destruction of *pupae* of the insect in the soil. This is being done on a fairly large scale in the present year. The whole work was discussed in detail by the research sub-committee of the Indian Central Cotton Committee in January 1927, and various suggestions made. The investigations have brought out the importance of the *pink* boll-worm in the latter part of the season at Surat which was not previously known, and to the necessity of controlling this pest also.

3. *Study of Cotton wilt and of American Cotton at Dharwar.*—The grant of Rs. 25,000 a year for these studies from the Indian Central Cotton Committee has been continued in the year under report. The results on the improvement of Dharwar-American cotton seem now definite, and a fixed type has been evolved, equally high yielding with the Gadag No. 1 now grown, which gives cotton with a staple of $1\frac{1}{8}$ inch, and which grows healthily. It is now only a matter of multiplication for distribution on a large scale and this is now in hand.

The cotton wilt problem is also being successfully attacked on the lines of breeding resistant types which have all the other qualities desired, and types are now in hand which seem to have solved the problem. The direct attack on the wilt by submitting the soil to high temperature in the sun in the hot weather seems also promising and is now one of the main lines of attack.

4. *Study of the Physiology of the Cotton plant under Irrigation in Sind.*—Some years ago a grant of Rs. 20,000 a year was offered by the Indian Central Cotton Committee and accepted by the Bombay Government for the study of the physiology of the cotton plant under irrigation in Sind, but owing to the delay in starting the Sakrand Experimental Station, and

also to the extreme difficulty in getting a good man to take charge of the work, it has not hitherto been possible to get the work started. At the latter end of the year under report, these difficulties have been solved, and the work has been arranged for at Sakrand under the charge of Mr. B. M. Dabral, M.Sc. I think it will lead to very important conclusions.

The above enquiries on crops have been financed by the Indian Central Cotton Committee. We have also received funds from the Sir Sassoon David Trustees as grants in aid of certain inquiries as follows :—

(*a*) *The improvement of Grass Lands.*—Rs. 2,500 were received during the year, following grants of Rs. 5,000 per annum for several seasons. The results obtained have shown that rotation in grazing will and does lead to a much greater production of grass from grazing areas. The best and most practical method of applying this is now under very careful inquiry in several regions in Poona, in East Khandesh, in the Konkan and in Upper Gujarat.

(*b*) *The improvement of the Bajri Crop in the Deccan.*—The study of this problem has been subsidised to the extent of Rs. 4,500 in the year under report, following annual grants of Rs. 6,666 for several years. The work is difficult owing to extensive cross-fertilisation which takes place with *bajri* but one or two types have now been obtained which give a very much increased yield, even under drought conditions. The work of multiplying these is particularly slow, but is vigorously in hand.

(*c*) *The checking of Jowar Stem Borer.*—This is another investigation which is subsidised by the Sir Sassoon David Trustees. Many more data have been collected, and the previous results confirmed. The material is being worked up for publication, and seems to confirm the opinion expressed last year that real progress has been made in practical methods of dealing with the pest,—by ploughing up stubbles and exposure of *kadbi* to the sun.

(*d*) *The improvement of the Mango Crop.*—This is the second year of this study, and results are already being obtained. The subsidy from the Sir Sassoon David Trustees amounts to Rs. 5,000 per annum and the work is in the hands of Mr. P. V. Wagle, M.Ag. The relative part taken by insects (the mango leaf hopper) and by mildew in the blight which takes such a large toll of the mango crop each year has been determined,—and rational methods of control are

being developed. I consider this investigation as of great promise.

In the year under report, other subsidies for work not directly relating to the improvement of crops have been offered by the Indian Central Cotton Committee and by the Sir Sassoon David Trustees. Some of these works are in hand during the year 1927-28. The amounts received are :—

I. *Indian Central Cotton Committee.*	Rs.
(*a*) Towards the cost of the investigation of cotton improvement in Khandesh	5,000
(*b*) The finance of the cotton crop in Central Gujarat	5,000
(*c*) The finance of the cotton crop in Sind ..	5,000
(*d*) A re-examination of the finance of the cotton crop in Khandesh	5,000

The results of the work on (b), (c) and (d) will be noted in next year's report.

II. *Sir Sassoon David Trustees,*	Rs.
(*a*) The economic efficiency of agricultural implements	2,700
(*b*) Purchase of a tractor and implements for use in West Khandesh	7,000

The whole of the work for which we are so indebted to these bodies could hardly have been undertaken in the absence of these subsidies. I think the thanks of Government are due to these bodies for the very large assistance they have given in the directions noted.

Improvements in Tillage and in Implements.—Thanks to a special grant from the Sir Sassoon David Trustees for the last three years it has been possible to do certain fundamental investigation on black cotton soils under the climatic conditions of the Deccan, into the question as to what is really required in methods of cultivation. It is obvious that the object of cultivation in these somewhat coarse soils, which are dry during a large part of the year, may be quite different from that in the moist soils for which most western implements have been designed. The work was placed in the hands of the Professor of Agriculture, Poona Agricultural College, and his provisional conclusion, soon to be published as a bulletin, are as follows. The loosening of the soil in cultivation in black soil, however obtained, has little effect on crop yield. Under the black soil conditions of the Deccan, the turning over of the soil seems to

have some but not a great advantage, over mere loosening, but the loosening of the soil below six inches deep does not lead to any increased and improved growth, whether this increased depth be brought about by a blade harrow or a subsoil plough. The loosening does not affect the total water content of the soil, but it does increase nitrification, and while it reduces perennial weeds it increases annual ones. These are provisional conclusions, but they are important, and if, confirmed, will lead to important modifications in the character of the implements used in land cultivation in the Deccan.

Something must be said about the extension of motor tractors. The tests made at the Presidency Agricultural Show indicated that the time has passed when the main question to be decided is as to the type of tractor to employ. There are now a number of extremely efficient motor tractors on the market and very good implements suited for them,—and the result is that there has become a demand for their use, as a means of cultivation more deeply and thoroughly than can be done by bullocks, and also as a method of doing the work more quickly and at a time of year when it could hardly be done by bullocks. As a result large numbers of tractors have been employed by farmers in Gujarat. Most of these have been bought and used by speculators, who work on hire. A few of the larger landowners have purchased their own. But fifty or more such implements are available and ready to work in Gujarat to-day.

No such progress has been made in the Deccan and Karnatak. Some of the firms who sell tractors have undertaken demonstrations. Recently, in response to a local demand, Government have paid half the cost of a tractor and equipment bought by the Dharwar Agricultural Association, and this has already found an extensive demand in their district. Still more recently a tractor equipment has been purchased for West Khandesh from funds supplied by the Sir Sassoon David Trustees, Government undertaking to pay the cost of running the tractor. The organisation of the local arrangements, including the repair of the tractor, has been undertaken by the District Local Board. Other districts, notably Bijapur, have applied for similar arrangements.

In Sind, two tractors and equipment were bought in 1926, and fairly full data are now available as to the conditions of successful work at least in Central Sind. These have been published in a recent bulletin of the Agricultural Department (No. 145) on the Sakrand Experimental Station. In Upper Sind the large Zemindars are very keen on tractor development

and if demonstrations could be carried on and reliable data given to them, there would be an early and considerable demand.

Dry Farming.—The importance of increasing production and making it more reliable in the precarious tracts of the Bombay Presidency and especially of the Deccan cannot be over-estimated. Irrigation cannot be widely extended because of the capital cost involved, and at present (1926-27) 95·5 per cent. of the cropped area in the Deccan is without the assistance of irrigation. The figure in the Karnatak is still greater, being over 97 per cent. Under these circumstances the closely connected matters of land improvement by embanking and levelling, and of such cultivation as will make the best use of the precarious rainfall are among the most important matters that can be worked out. The Dry Farming Station at Manjri, which was established in 1924, has now worked out methods which have given remarkably increased yields of grain, without any extra out-of-pocket cost, but only increased work on the part of the cultivator. These methods and the results have been described in a recent bulletin of the Agricultural Department (No. 142 of 1927) and are so good that one of the early lines of propaganda must be to extend the knowledge of these methods far and wide in the Deccan. I consider this is one of the most important pieces of work that the Agricultural Department has on hand.

Ridge Cultivation.—This system of cultivation, especially designed for the deep black soils of Lower Gujarat, has been described in Bulletin (No. 123 of 1925) of the Bombay Agricultural Department, and is now rapidly extending in the Surat District. Some large landowners are converting all their property to this system. No further methods have been devised, and it is now merely a matter of extending it in areas to which it is adapted.

Manuring.—One of the most remarkable movements in recent years is the extension of the use of concentrated manures in the Bombay Presidency, most notably, of course in the irrigated tracts. In fact in these latter, for sugarcane at any rate, the amount applied is unnecessarily high. But compared with the possibilities the amount used is small. The immediate openings for such manures are perhaps—

(*a*) the use of sulphate of ammonia on the seed-beds of rice both in the north Konkan and in the *ghat* tracts;

(*b*) the use of sulphate of ammonia as a field manure for transplanted rice in the north Konkan at a rate which, we have found, may profitably go up to 300 lbs. per acre;

(*c*) the use of bone-meal as a field manure for rice in the red soil areas of the south Konkan and Kanara particularly the latter ;

(*d*) the use of nitrate of soda as a manure for onions in the Nasik District ;

(*e*) the extension of rapidly acting manures for cotton in Khandesh. These have hitherto consisted of a mixture of oil cake and sulphate of ammonia ;

(*f*) the use of artificial manures for tobacco in the Kaira District.

A large series of experiments were made in the cotton tracts of Khandesh in the year under report which are being published as a Bulletin (No. 143 of 1927) of the Agricultural Department. They have shown the very great advantage of concentrated manures, and particularly of sulphate of ammonia, even in a bad year like the one under report.

Horticultural Work.—I have already referred to the work, subsidised by the Sir Sassoon David Trustees on mango in the Konkan. The main other avenues of horticultural work, chiefly in the hands of the Horticulturist to Government, are :—

(*a*) the study of the die-back of citrus trees. This proves to be largely a matter of drainage and healthy conditions for the free development of the roots, and several citrus plantations which were in a very bad state have been recovered by attending to this matter ;

(*b*) the study of guavas. These fruits, the commonest and hardiest in the Deccan are capable of much improvement, both as to variety and as to method of cultivation. A bulletin is now in the press giving the results of the latest information regarding the best methods of treatment ;

(*c*) the improvement of Deccan grapes. Efforts in this direction have largely been in the nature of attempts to improve the yield of the shybearing types which represent the good quality grapes of the Deccan. The results of artificial fertilisation of the *Pandhari-Sahebi* and other good varieties have been full of promise. The introduction of exotic types is still questionable.

Checking of Pests and Diseases.—The biggest success of the year has been the checking of rats as an agricultural pest in the rice areas of Lower Sind, by fumigating the burrows. The first material successfully used for this purpose was carbon

bisulphide, but since last year's report was written still better results have been obtained by the use of Calcium Cyanide dust. We have, in this, got a perfectly successful method, when used in the rice bunds in August to October, at a cost which will not exceed Re. 1 per acre. This is very great progress, for the pest usually takes away a quarter of the crop in many parts of this region and often much more.

I must refer here to two pests of the grasshopper type which were very bad in 1926-27 and which bid fair to be even worse in 1927-28. These are (1) the Deccan wingless grasshoppers (Colemannia) which are found from Nasik to Dharwar and commit havoc on the *kharif* grain crops from the seedling stage until the crop is nearly ripe. It has been dealt with successfully by drawing bags over the fields in the seedling stage of the crop when the hoppers are collected by millions. But it is questionable how far this is generally applicable and other methods are being tried.

A still more serious matter was the attack of the regular migratory locusts (*Acridium peregrinum*) in Sind and Northern Gujarat between October 1926 and February 1927. This was the most serious since 1906, and in many parts of Sind at least, and also, perhaps to a less extent, of Northern Gujarat did enormous damage. Of course, beyond driving the swarms away by noises, lights, and other means of frightening the locusts, little could be done at this stage, but a very large series of observations were made on the insect and the swarms which have been recorded in an article published in the Agricultural Journal of India. The seriousness of the situation became obvious when a very unusual attack of fresh swarms of locusts occurred in East Sind in May and June 1927. It seemed clear then that if heavy rain occurred in the desert tracts between Gujarat and Sind in July or August, the danger of a very serious attack in October and succeeding months of 1927 was very great. Such rains did occur, and as the only real method of dealing with locusts is in the egg and hopper stage, I advised an extensive system of watching for hoppers, and the employment of squads of men to destroy them when they were found. Government placed Rs. 10,000 at the disposal of the Commissioner in Sind for this purpose. But severe attacks have already begun as I write (October 16, 1927) in the Nawabshah and adjoining districts, and it seems likely that it will be a very serious year for this pest.

Many other insect pests and blights are under study, but there has not been enough progress made to demand attention.

Livestock Improvement.—The work of the Agricultural Department in the direction of cattle improvement consists in the maintenance of herds of cattle of high quality at Karachi (Red Karachi breed and with some Thar-Parkar cattle), at Chharodi in Upper Gujarat, and at Surat in Lower Gujarat (Kankrej breed) and at Bankapur in Dharwar (Amrit Mahal breed). During the year the Department took over the Sangvi Farm in Khandesh belonging to the Shirpur Taluka Development Association where there is a fine herd of Tapti Khillari cattle. The Department also assists other bodies to maintain high class herds of cattle and in putting out premium bulls among the villages of the Bombay Presidency including Sind.

The herds on all these farms are manifestly improving in value, and this is reflected in the regularly increasing demand for premium bulls from them. All that are available are picked up immediately, and whether the breed kept is primarily a milk breed (as at Karachi and Surat) or primarily a work breed (as at Chharodi and Bankapur) every bull that is fit to serve is in demand. For the breeds studied, I doubt whether there are now herds equal in characters to those at Karachi, Chharodi or Surat.

I might refer here also to the very excellent herds of Sindhi cows and Surat buffaloes at the Agricultural College, Poona. These are maintained primarily for teaching purposes but advantage has been taken to breed cattle of high class milking capacity. After making allowance for the cost of teaching, the College Dairy now pays very well.

Premium bulls have been distributed more widely this year than ever before, and the areas to which the Department supplies bulls have been extended in 1926-27 to East Khandesh and to North Sind. In the last area a number of Bhagnari bulls of high quality have been distributed, largely, with the co-operation of Mr. D. MacLachlan, Deputy Commissioner, Upper Sind Frontier. The actual number of premium bulls now doing service in the Presidency and Sind is 171.

Live stock improvement is also carried out in co-operation with certain public bodies, notably with the Bombay Gowrakshan at Kandivli and at Mulund. At the former the Gowrakshan authorities are maintaining, in co-operation with Government, a herd of pure bred "Gir" cattle. The farm started three years ago with forty head of Gir cows as pure as were available, with two bulls. Today the herd has 121 head of live stock, and the male stock now number 36. Some bulls have already been sent out, and more are nearly ready.

The importance of sheep breeding is becoming more and more realised, in view of the very excellent conditions for sheep keeping in the Eastern Deccan, and the very poor quality of the sheep now kept. The possibilities of improvement have been shown by experiments conducted by Rao Saheb S. S. Mangsuli of Athani in co-operation with the Agricultural Department, and among the most striking exhibits at the Presidency Agricultural Show last October, were the cross bred sheep obtained by the use of three-quarter bred Merino rams from Hissar. The question of a big advance in this direction is now under consideration.

Poultry.—The Central Poultry Breeding Farm at Kirkee has now been fully established, and already the quality of the pedigree Leghorn and Australorp fowls is being appreciated and a demand for cocks and for sittings of eggs is arising. A Bombay Poultry Association has been established during the year, and this held its first show (which was very successful) in connection with the Presidency Agricultural Show in October 1926. The marketing of eggs and fowls has been carefully studied during the year, and at Sangli, which is one of the large egg producing centres, a Poultry Club for the marketing of eggs and fowls by weight in Bombay has been established, and is of great promise. The possibilities of expansion of the poultry industry in the precarious tracts seem very great. Very great praise is due to Messrs. J. L. Goheen and D. A. Lotlikar for their work in connection with the Sangli experiment.

Investigations on Agricultural Economics.—Since the appointment of the Professor of Agricultural Economics two years ago it has been possible to undertake some very necessary investigations which could not be previously done. The main line of work undertaken has been that of the investigations of the cost of production of crops. Hitherto the main work has been done in the Deccan and the results of two enquiries respectively into the cost of production on a number of crops round Poona in 1925-26 and in 1926-27, and into that of sugarcane grown in partnership on the Varna river are being published as bulletins of the Agricultural Department. Such enquiries as those will be of immense importance, because although hitherto a certain number of data have been in hand as to cost of production, we have not known how far they could be applied generally throughout the country. I attribute very great importance to an extension of this work.

The other line of investigation under this head is that of the actual methods of marketing in vogue in different products in

different parts of the country and how this marketing of crops is financed. In this connection I may first refer to the special enquiries conducted by the Agricultural Department but paid for by the Indian Central Cotton Committee. The results of the enquiries in Khandesh have been of great importance, so much so that in fact we are asked by the Indian Central Cotton Committee to repeat them during the present year so as to find out how far the original enquiry was conducted in a normal season. The enquiry in Gujarat is not by any means so conclusive or so clear, but the results are nevertheless of considerable importance. New investigations of this sort are being undertaken in Central Gujarat and in the cotton producing tracts in Sind. Beyond this, careful enquiries have been made in the marketing of a considerable number of products at the request of the Royal Commission on Agriculture. These were done by special men engaged for the purpose and the results are very interesting. After the Royal Commission have considered them, it *may* be possible to publish them as a bulletin of the Agricultural Department.

Sind Experimental Scheme.—As Director of the experimental work in connection with the Sind Development and especially of that portion concentrated at the Sakrand Experimental Station, I have prepared a note which is attached (Appendix U) to the present report. It would seem that a very fair beginning has been made, and it seems probable that by the time the Sukkur barrage water is available, we shall know a very great deal more than we do at present about the best way of developing the barrage areas, of the crops and the types of crops which will give the best returns, and of avoiding the difficulties (notably water-logging and salt) which are almost certain to arise.

Propaganda and Organisation

As I stated last year the discovery of improvements is a very small step in the greater part of Western India, to getting them introduced. The much larger step of bringing them to the knowledge of the people is being undertaken by district overseers of whom there are on an average two per district, working under the control of a corps of six deputy directors of agriculture, by certain officers of the Co-operative Department, termed as Agricultural Organisers, who have done similar duties but with special stress laid on the organisation of the population for agricultural purposes into co-operative societies and by the officers of the Revenue Department whose assistance in the introduction of certain agricultural improvements has been of great value.

The above are official agencies. I, myself, believe however, that unless we can get non-official agencies to co-operate and to work with energy for agricultural improvements, progress will be very slow. Hence I have welcomed the hearty co-operation of Taluka Developments Associations, of Co-operative Societies of every sort, of Agricultural Associations, such as the Dharwar District Agricultural Association, and now of District Local Boards.

The Taluka Development Association movement has made considerable progress during the year under report. A year ago there were 59 such associations in existence; now there are 74, distributed as follows:—

Gujarat Division	6
Khandesh and Nasik Division	20
South Central Division (Poona, Ahmednagar, Satara and Sholapur)	13
Southern Division (Bijapur, Dharwar and Belgaum)	11
Konkan Division	9
Sind	15
Total ..	74

Out of these 74 associations, 11 were formed in the year 1922-23, 27 in the year 1923-24, 10 in the year 1924-25, 11 in the year 1925-26, and the remaining 15 in the year 1926-27. Subsidies amounting to Rs. 33,344 were paid to these associations in the year under report.

The line of work which these associations undertake has been similar to that in previous years. They have been very actively engaged in extending the use of improved implements of many kinds, and many of them have depôts for the hire of implements. In Sind the Associations have in several cases organised the local manufacture and sale of some of the simpler implements like screw water lifts and Egyptian ploughs. They have also demonstrated the value and extended the use of improved seed, notably of cotton in many areas and of wheat in Sind. They have been active in checking diseases like smut in Jowar or *tambera* disease of the potato, and the Sirsi Association in Kanara has been an agent in the extension of spraying against the *koleroga* disease of betel palm. They have organised shows, some of which are noteworthy like that arranged by the Kambar Taluka Association (Sind) in the year under report. They have been the active agents in promoting the formation of non-credit co-operative societies. They have

pushed small irrigation schemes as at Awasari Khurd in the Poona District. The Athani Association(Belgaum) has arranged an admirable system of fodder storage for the taluka. Some are planning cotton breeding schemes as in Bhusawal (East Khandesh). While the keenness with which these associations are run varies very much, and while the activity in many cases is not great, the remainder make up for the deficiency of the few. On the whole the Konkan Associations are the weakest though there are good ones among them—and those in Khandesh and Nasik, and in Sind are the strongest. On the whole these associations are becoming or have become a very essential part of agricultural propaganda in the country.

The proposal of the District Local Board, Satara, to subsidise the Associations to the extent of Rs. 500 per annum to each Taluka Development Associations in all the talukas of that district has been brought into operation during the year under report, and promises well. The District Agricultural Overseer has been detailed to work in connection with this scheme, and much progress has already been made. I think there can be no question as to the continuance of the experiment, for ultimately the District Local Board will be the natural body to supervise propaganda for rural improvement in the districts. This however is only a wider example of what is happening in very many cases, for District Local Boards and Taluka Local Boards are both subsidising, to a limited extent, the Associations in their district.

I may again at this point refer to the work of the District Agricultural Association in Dharwar, which has, with no subsidy whatever, acted as a central propaganda agency for many years in the Dharwar District. It now possesses a central building in Dharwar, acts as a central hiring and sale agency for implements, has been a very useful agency for seed distribution, has controlled, in the early days of cotton improvement, an auction for the sale of improved cotton and groundnut, and has run a Kanarese Agricultural Magazine. It has led the way, too, in developing fruit cultivation near Dharwar. It has established a tractor for demonstration in the Dharwar District during the year under report. I have arranged for the last two years that one of the propaganda staff of the Agricultural Department should work through this Association, and this arrangement is still continued. During the year the leader of this Association, Mr. S. V. Desai, has been honoured with the title of Rao Saheb.

In the matter of rural propaganda, the Agricultural Department works in close co-ordination with the Co-operative Department, as it is the recognised policy that wherever possible, any attempt to organise the rural community should be on co-operative lines. This co-ordination is secured by the existence of Divisional Boards of Agriculture, which are predominantly non-official, meet once a quarter, and control the propaganda and organising work of both departments in various districts.

The various fields of co-operative organisation in the districts, so far as their activities other than credit are concerned have developed to a very variable extent. The greatest success has been with co-operative sale, and to the previously recorded success of the Co-operative Sale Societies for cotton at Hubli and Gadag in the South, and in Gujarat, together with *gul* sale societies in the Deccan, may now be added societies for the sale of chillies in the Karnatak and of betel nuts in Kanara. Again, implement hire societies are an established success in many places. Co-operative Supply Societies are still not extending to any great extent.

The Hubli and Gadag Co-operative Cotton Sale Societies have again been among the most valuable agencies in extending improved cotton seed in the Karnatak, as has been described in a previous section of this report. Considerable difficulties arose in the working of the latter society (Gadag) in the year, and I was afraid that its utility as a means of multiplying and distributing this cotton seed would be injured if not destroyed. Arrangements have, however, been concluded during the year under report, by which I think it will continue to serve as our agent for the multiplication and distribution of improved American cotton seed as hitherto.

Cotton Transport Act

The working of the Cotton Transport Act during the year under report has been eventful, but there is now general satisfaction, and it has without doubt prevented admixture of cotton in many areas.

In Gujarat, as the Co-operative Societies in the Olpad Taluka have agreed to sow the approved cotton seed of the Agricultural Department, the restriction as to transport of cotton by road over the country to the south of the Nerbudda river has been removed. The success of this policy of relaxation will depend, of course, on the very rapid elimination of inferior cottons all over this area, and I think I may say that this

elimination is taking place, though only very slowly. All the same, the demand for guaranteed seed is far greater than we can supply. Although we distributed nearly sixteen lakhs of pounds (actually 15,86,620) of seed in the year under report, demands were received for five lakhs of pounds more which could not be supplied.

In the Kumpta-Dharwar Protected Area, Government have given discretion to the Director of Agriculture to allow cotton from certain areas in the Muddebihal taluka (Bijapur) to go to Bagalkot market instead of to Bijapur. Otherwise, matters remain as before.

Rural Organisation

Very intense discussion has taken place during the year as to the steps which should be taken towards rural reconstruction, but little has been done. I would, however, reiterate that in attempting to consider the rural reconstruction required it is not one man or one department which is concerned. It involves the consolidation of holidings, the communal or co-operative holding of implements which are beyond the power of individual peasant cultivators, and the development of secondary occupations. It involves further the organisation of purchase of supplies and of sale of produce. It means the partial (and very possible) elimination of ill-health and malaria in the villages, and extension of education. The necessity is beginning to be realised and this is the first step toward that reconstruction which is needed, as a complement, to the technical improvement with which I am more immediately concerned.

SERVICE

Apart from research and propaganda, there are certain services which the Agricultural Department performs for the agricultural public, the chief being the supply of certain kinds of seed in large quantities, and of implements and manure in certain cases, the boring of wells and the designing of pumping plants and, in recent years, the designing of land improvement works for construction by individuals or by Co-operative Societies.

Supply of Seed and Implements.—The supply of seed has been part of the work for the improvement of cotton in Surat, in the Southern Maratha Country, in Khandesh, and in Sind. In all these cases, seed is produced under the Department's own control for a limited area, and this is multiplied either by the Department itself or by a Co-operative Society with the assistance of the staff. The most elaborate organisation for cotton seed distribution is in Lower Gujarat, where in the year

under report the quantity dealt with was 2,099 *bhars* of seed. This was all that was available, but the demand was for far more than this. It was distributed in the Surat, Broach, Ahmedabad and Panch Mahals districts, and large amounts were sent to the Rajpipla, Chota-Udepur and Mangrol States, while some went to Hubli. The actual multiplication and distribution of cotton seed in the Southern Maratha Country, beyond the amount needed to grow about 5,000 acres each of improved Kumpta cotton and of improved American cotton is in the hands of the Co-operative Cotton Sale Societies at Hubli and Gadag, respectively, and has been previously referred to. In Khandesh the original supply of pure N.R. cotton seed (amounting in 1925-26 to 25,000 lbs.) on the Dhulia and Jalgaon farms was distributed to taluka Development Associations, Co-operative Credit Societies, and the three branches of the Provincial Co-operative Bank at Shirpur, Dhulia and Parola as well as to certain individuals. These all arrange to multiply it, and then sell to their clients. In Sind, the Agricultural Department runs a small zamindari at Chellaro on the Jamrao Canal, especially for the production of pure cotton seed of the best deshi type and where 1,75,520 pounds of seed were produced in 1926. Nearly double this amount is collected from our authorised seed growers, and also distributed. Beyond this point the further multiplication is in the hands of the local bodies and individuals. The demand is far in excess of what we can supply.

In the North Konkan, we have undertaken the production and distribution of rice seed on a large scale, as we have guaranteed to give out improved seed for a large area each year, and this will be continued until we can get a co-operative organisation or a private person to undertake it.

In the tobacco region of the Kaira district, we are now planning to supply guaranteed tobacco seed of the Gandiu strain No. 6 for at least 1,000 acres each year.

Boring

Boring for underground water is now recognised as a means in some areas of increasing the water available in wells, and in others as a means of finding water where the digging of wells is, under other circumstances a very risky undertaking. The boring equipment of the department is now very large having increased in recent years as a part of the schemes in hand for the prevention of famine. In 1925, orders were issued for the purchase of 16 power boring machines and for the conversion of practically

the whole of the hand boring machines of the Agricultural Department, capable of going to a depth of 200 feet, to power. It was not possible however, to complete all these conversions in the year.

With the equipment in hand the following was the record of work in summary, in the different divisions. A detailed account of bores done under the control respectively of the Deputy Directors of Agriculture and of the Agricultural Engineer is appended to each of their reports in accordance with Government orders. The work summarised here excludes that done with the machines lent to the District Local Board, Kaira, but includes all others :—

Division	Total bores	Successful bores	Unsuccessful bores	Bores in progress
1. Gujarat	56	33	20	3
2. North Central Division ..	24	16	8	..
3. South Central Division ..	48	24	20	4
4. Southern Division	34	24	56	4
5. Konkan	31	16	8	7
6. Sind	..	..	..	..
7. Famine Boring Scheme ..	158	114	44	..
Total ..	351	227	106	18

This shows a very large increase of bores made in the year under report. The proportion of unsuccessful bores is slightly less than in the previous year—30·2 per cent. instead of 33·4 per cent. The largest percentage of failure occurred in the South Central Division.

Land Improvement

The loss which annually occurs owing to the run off, from the surface of the land, of the water which falls in the famine districts, is very great indeed, and there have always been efforts by almost every energetic cultivator to prevent these losses, and to provide irrigation from tanks formed by such run-off water or to embank valleys so as to increase the water in wells lying below the land, or to protect land by terraces or bunds across the surface. Technical skill is not, however, always present.

This technical skill is now provided by a Superintending Engineer recently appointed to deal with schemes of such land improvement, but smaller schemes of *bunding* for protection against run-off are still in the hands of the Agricultural Department. For the purpose of preparing such schemes, three men are employed termed "bunding officers." They are not

engineers but are what we may call agricultural surveyors and devote themselves entirely to the preparation of schemes for field embankments or *tals*. In the Southern Division, in the year under report, where the work is most developed, 395 such schemes were prepared, to protect an area of 7,900 acres, and most are actually being carried out. In this division, a step in advance was made this year in the preparation of joint schemes for bunding at two places. These joint schemes have many difficulties but experience is being gained.

In the South Central Division, the work is just beginning, and twenty schemes were dealt with during the year.

Fodder Storage.—The Agricultural Department has been entrusted with the work of purchasing, shredding and baling and storing *Jowar kadbi* on famine account, at Karajgi in the Dharwar District. This place was chosen on account of the fact that on a series of years it was the cheapest centre for the purchase of *kadbi*, and the shredding and baling plant has now been in operation for three seasons. In the first year the machinery failed badly, probably because the *kadbi* with which it had to deal was much thicker and stronger than that for which it was designed. In the year under report the knives were stiffened, and as a result it was possible to shred, bale and store 30,43,341 lbs. of kadbi. The cost of shredding and baling came to Rs. 5-2-3 per 1,000 lbs. of baled fodder.

Work against Wild Pigs.—The control of this, one of the worst pests of our cultivated areas, both those adjoining forest areas, and those in the extensively cultivated canal tracts in the Deccan, is carried on by three methods. The first is the encouragement of fencing of large areas by co-operative fencing societies formed for this purpose, and this method has led to the existence of a number of such societies particularly in the area bordering on the Kanara forests. The societies so far formed used stone walls for fencing, and there are now twelve such societies in existence. They have proved a great success, and the land protected by the walls has already increased in value considerably. A number of other societies are in course of formation, but difficulties connected chiefly with the apportionment of cost, and with recalcitrant land-owners who refuse to enter in the scheme, make progress more slow than would otherwise be the case. A campaign for the removal of prickly pear, which harbours pigs, has been carried out at Mundargi, in the Dharwar District, with much public appreciation.

In the Deccan Canal areas and adjacent tracts, where there is not the reservoir of pig in the neighbourhood formed by the

forests, we have adopted a system of pig-killing campaigns, with the hearty co-operation of the cultivators in the area in question. A special officer has been kept to direct these campaigns, and the work is paid for partly by the Agricultural Department and partly by the people themselves. Six campaigns were conducted during the year, and 230 pigs were killed. The work is very much appreciated by the cultivators, as a successful campaign removes the nuisance for a number of years to an extent which cannot be measured by the number of pigs actually killed.

Agricultural Education

Agricultural College.—The Poona Agricultural College has now entered upon its nineteenth year, and it is as popular as ever. This year (1927) there are 77 students in the first year class. This is quite as much as the College can deal with. The total number now on the roll of the College is 220. The demand for admission from all parts of India continues, but now we are limiting admission for students outside the Bombay Presidency to about ten per cent. of the total in the first year's class.

Rao Bahadur P. C. Patil acted as Principal of the College during the whole of the year under report. Various other minor changes in the staff took place, details of which will be found in the Principal's report (see Appendix B).

The result of the University examinations in Agriculture were fairly good in the degree (B.Ag.) examination where out of forty-six candidates who appeared twenty seven passed. In the Intermediate Examination the results were not nearly so satisfactory. Out of seventy-eight candidates forty-eight passed, three being placed in the first class.

The year under report is the second during which the new University course has been in use, and on the whole it has been considered satisfactory, and an improvement on that which preceded it. Its introduction has necessitated the appointment of two additional demonstrators in the Agricultural Engineering section of the College, and of a demonstrator of Agricultural Economics.

Agricultural Schools.—The number of Vernacular Agricultural Schools working remains six as before. These are, as follows, with the number of students in each :—

Marathi	Loni (Poona)	46
	Jambul (Thana) ..	22
	Dhulia (West Khandesh) ..	32
Kanarese	Devi-Hosur (Dharwar) ..	27
Gujarati	Godhra (Panch Mahals) ..	23
	Surat	31

It will be seen that the total for the six schools now amounts to 181 as against 191 a year previously. The schools are all nearly full.

They remain popular, and all receive a certain amount of support from District Local Boards and some from private bodies. The boys leaving them are in demand, and either go to their own farms or are snapped up by others who need lands with such training as we can give.

Agricultural Bias Schools.—The new type of primary schools with an agricultural bias, first established in 1922, has been extended in the year under report. We have a temporary arrangement by which we train teachers for these schools, doing the work at the Vernacular Agricultural Schools previously described. We, also, through the Inspector of Agricultural Schools, inspect the technical work done in these schools. The results so far obtained seem satisfactory, the schools have become popular, and the number will be increased as fast as teachers are available properly trained to take charge of the classes.

Statistics

The Director of Agriculture is responsible for the agriculture and price statistics published in the Bombay Presidency and for the forecasts of crops issued periodically during the year. With regard to forecasts, I may call attention to the recent increase in the number of these, the latest addition being that on the castor crop started in 1924 at the request of a number of commercial firms in Bombay. There is now a demand for an additional forecast for cotton in April.

During the year the work of compiling statistics of the cotton pressed in the Bombay Presidency by the Director of Agriculture under the provisions of the Cotton Ginning and Pressing Factories Act has been continued. For the first time we have now a means of checking the accuracy of our forecasts of cotton production, and I am glad to say that in the Presidency proper, they stood the test very well. The figures for Sind were, however, unsatisfactory, being much below the actual production, and correspondence with the Commissioner in Sind resulted which I hope will have the effect of leading to more care in preparing the returns.

Publications

The following publications representative of the research activities, and in part, representative of the propaganda activities of the Agricultural Department, have been issued during the year.

Memoirs

1. Studies in Gujarat Cotton, Part IV. Hybrids between Broach-deshi and Goghari varieties of *Gossypium herbaceum* (Botanical Series) by Messrs. M. L. Patel and S. J. Patel.
2. Studies in Khandesh Cotton, Part I, by Mr. S. H. Prayag (Botanical Series).
3. The Kolamba Rice of the North Konkan and its improvement by selection by Messrs. R. K. Bhide and S. G. Bhalerao (Botanical Series).

Bulletins

1. No. 125.—Some of the promising exotic sugarcane varieties of the Manjri Farm by Rao Bahadur P. C. Patil.
2. No. 128.—Cotton cultivation in Sind by Khan Bahadur Gulmahomed Abdur Rehman.
3. No. 129.—The treatment of patches of inferior tobacco in North Gujarat.
4. No. 130.—Some useful forest trees and shrubs of the coastal tract and their fodder value by Mr. M. S. Tuggerse.
5. No. 131.—The Fig Industry in Asia Minor by Dr. G. S. Cheema.
6. No. 132.—The improvement of tobacco in Northern Gujarat by Messrs. H. H. Mann, M. L. Patel and V. M. Majumdar.
7. No. 133.—Work of the Ganeshkhind Botanical Gardens and Modi Bag Garden for the years 1921-1925.
8. No. 134.—Murrah Buffaloes in Sind by Mr. A. M. Ulvi.
9. No. 135.—An improved method of growing turmeric in the Deccan by Mr. H. M. Desai.

Leaflets (with Vernacular Versions)

1. No. 4 of 1926.—The Katra or Hairy Caterpillar of Gujarat.
2. No. 5 of 1926.—New type of tobacco seed No. 6.
3. No. 6 of 1926.—List of implements recommended by the Agricultural Department for the Deccan and Karnatak Districts.

4. No. 7 of 1926.—Lucerne as a dry crop in the Dharwar District.
5. No. 8 of 1926.—Treatment of Gum-disease of Mosambi plants.
6. No. 9 of 1926.—Breeds of Cattle in the Bombay Presidency I.—The Kankrej Breed of Gujarat.
7. No. 10 of 1926.—Breeds of Cattle in the Bombay Presidency II.—The Gir Breed of Cattle.
8. No. 11 of 1926.—Breeds of Cattle in the Bombay Presidency III.—The Sindhi or Red Karachi Cattle.
9. No. 12 of 1926.—Tapioca cultivation in Kanara and the Konkan.
10. No. 13 of 1926.—Remedies for Koleroga disease of betelnuts.
11. No. 14 of 1926.—Vinegar making.
12. No. 15 of 1926.—Breeds of Cattle in the Bombay Presidency IV.—The Krishna Valley Breed.
13. No. 16 of 1926.—Breeds of Cattle in the Bombay Presidency V.—The Khillari Breed of Cattle.
14. No. 17 of 1927.—Breeds of Cattle in the Bombay Presidency VI.—The Amrit Mahal Breed.
15. No. 18 of 1926.—Breeds of Cattle in the Bombay Presidency VII.—The Dangi Breed.
16. No. 19 of 1926.—Breeds of Cattle in the Bombay Presidency VIII.—The Thar Parkar Breed.
17. No. 20 of 1926.—How to get information from the Agricultural Department.
18. No. 1 of 1927.—List of implements recommended by the Agricultural Department for Gujarat.
19. No. 2 of 1927.—List of implements recommended by the Department of Agriculture for the Konkan Division.
20. No. 3 of 1927.—List of implements recommended by the Department of Agriculture for Sind.

21. No. 4 of 1927.—Chaff-cutters.
22. No. 5 of 1927.—A practical system of storing farm yard manure.
23. No. 6 of 1927.—Control of the powdery mildew of grapes.

A large number of further bulletins and leaflets are in the press.

Finance

The expenditure of the Department amounted to Rs. 16,46,200 during the financial year 1926-27, as against Rs. 16,14,250 in the previous year. The receipts amounted to Rs. 2,78,100 as against Rs. 3,09,180 in the previous year. The former is exclusive of Rs. 6,655 on account of boring receipts credited to the Famine Insurance Fund.

As regards the Personal Ledger Account, which is used for financing seed, etc., the total amount advanced amounted to Rs. 57,729, while the recoveries credited during the year were Rs. 1,36,376.

Subsidies were received from the Indian Central Cotton Committee, for the pieces of work mentioned in the report, to the amount of Rs. 64,765. The expenditure against this amounted to Rs. 66,000 during the year :—

The following amounts were received during the year from the Sir Sassoon David Trustees :—

Rs.	3,000	Contribution to six Vernacular Agricultural Schools.
,,	2,700	Research on the economics of implements.
,,	5,000	Investigation on the mango crop.
,,	2,500	Investigations in the improvement of grass land.
,,	4,500	Investigations in the improvement of the *Bajri* crop.
,,	7,000	For the purchase of a tractor for West Khandesh.
Total Rs.	24,700	

Administration

I was in charge of the Department during the whole year. But from April 1926, when I took personal charge of the

experimental work under the Sind Development Scheme, a temporary position of Joint Director of Agriculture was created and has been filled by Dr. W. Burns. This has relieved me very considerably of the heavier part of the ordinary work of the office of the Director of Agriculture. Dr. Burn's position as Principal of the Poona Agricultural College has been filled by Rao Bahadur P. C. Patil.

During the year under report, several of the senior officers of the Agricultural Department have been on leave, notably Mr. T. F. Main who left us on February 12, 1927 for eight months. Mr. W. J. Jenkins, Deputy Director of Agriculture, N.C.D., continued on deputation throughout the year to the Indian Central Cotton Committee. Mr. B. S. Patel, Professor of Agriculture at the Poona Agricultural College, went on leave out of India in March 1927. In their places, Rao Saheb B. P. Vagholkar has acted as Deputy Director of Agriculture, S.C.D., Mr. K. M. Pawar as Deputy Director of Agriculture, N. C. D., and Mr. V. G. Gokhale as Professor of Agriculture, at the Poona Agricultural College.

This has necessitated further changes and Mr. C. S. Patel has acted as Deputy Director of Agriculture, Konkan, and Mr. R. Y. Hulkoti as Inspector of Agricultural Schools. The post of Assistant Professor of Agriculture at the Poona Agricultural College was filled by Mr. K. S. Kulkarni, during the leave of Mr. G. K. Ranade, the permanent holder of the position.

Rao Bahadur P. C. Patil acted as Principal, Poona Agricultural College, during the whole year in the absence of Dr. Burns on special duty, while Mr. G. B. Patwardhan did the work of Economic Botanist to Government also during Dr. Burns' absence.

Mr. F. J. Master, Personal Assistant to the Director of Agriculture, was on leave for 3½ months, when Mr. S. V. Shevde took his place.

I am sorry to have to record the death, during the year, of Rao Saheb M. L. Kulkarni, formerly one of the most successful Deputy Directors of Agriculture of the Agricultural Department. His achievements in the Southern Division will long remain a monument to his energetic and strenuous work.

The inauguration of the Sind Development Scheme necessitated the appointment of several men. That of Mr. K. I. Thadani as Economic Botanist under the scheme was noted

last year. In September 1926 Mr. V. A. Tamhane took charge of the position of Soil Physicist and Chemist at the Sakrand Agricultural Research Station.

Conclusion

This will be the last report I shall write as Director of Agriculture of the Bombay Presidency, as I retire during the coming year. On looking back during the years which have passed since 1918 when I first assumed the office of Director of Agriculture, it is wonderful to see how the Agricultural Department has developed its activities in various directions. Perhaps the most striking development has been in connection with the research activities of the Department and the work now done is altogether of a higher class than it was nine years ago, and the method of approach to the problems which it is necessary to solve is of a much more scientific character than was formerly the case. It is exceedingly pleasant to see how the members of the Department have been able to adapt themselves to the types of research and the application of the results which are now in vogue.

Further, I may say that the problems now under investigation are in almost all cases definitely those which have been suggested by actual difficulties in the practice of cultivators, and we know, as a result, that as soon as methods to get rid of the difficulties have been found, the people will be ready to try them in their practice and if they are found suitable to adopt them.

Again, the methods of propaganda have been very largely altered and now-a-days non-official agency, chiefly in the form of Taluka Development Associations, have enabled propaganda to be conducted so as to reach at least ten times the number of people that would have been reached before such associations were formed. It is only recently that these have entered into the vigorous life which many of them now possess.

There are many other changes to which I might refer, for instance, the increased popularity of the Agricultural Schools of the Department, the establishment of Agricultural Bias Schools in many districts with popular appreciation, the attempt to attack the rural problem from the engineering side especially in the direction of small schemes of land improvement, and so on. But perhaps the biggest change is that the increasing conception of the rural problem as a whole, rather than as a series of different questions each to be dealt with by separate departments, is gradually becoming paramount in the eyes

of many workers in connection with agricultural development. What this will lead to I cannot at present say, but it does seem to me to be the only effective way of studying the situation and seeing the most important thing to be done at any moment. Hence I hope this conception will dominate the workers in future to a greater and greater extent, and if it does, taken in conjunction with the enthusiastic and devoted work which is now put into agricultural development, I look on the future as one of great hopefulness.

HAROLD H. MANN,
Director of Agriculture.

APPENDIX A

List of Taluka Development Associations Organised up to date

According to the scheme laid down in Government Resolution No. 3378 dated 5th June 1922, Revenue Department, 74 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division	
Surat District	3
Ahmedabad District	1
Kaira District	2
Khandesh and Nasik Division	
East Khandesh District	10
West Khandesh District	6
Nasik District	4
South Central Division	
Poona District	3
Sholapur District	3
Satara District	7
Southern Division	
Belgaum District	3
Bijapur District	2
Dharwar District	6
Konkan Division	
Kanara District	2
Ratnagiri District	3
Kolaba District	1
Thana District	3
Sind Division	
Hyderabad District	4
Nawabshah District	1
Larkana District	2
Sukkur District	4
Thar and Parkar District	3
Karachi District	1

Out of the 74 Associations 11 were formed in the year 1922-23, 27 in the year 1923-24, 10 in the year 1924-25, 11 in the year 1925-26 and 15 in the year 1926-27 in the Talukas mentioned below :—

Year		Taluka	District
1922-23	.. 1.	Chorashi	.. Surat.
,,	.. 2.	Pachora	.. East Khandesh.
,,	.. 3.	Jalgaon	.. Do.
,,	.. 4.	Madha	.. Sholapur.
,,	.. 5.	Satara	.. Satara.
,,	6.	Khed	.. Poona.
,,	.. 7.	Dharwar	.. Dharwar.
,,	.. 8.	Ron	.. Do.
,,	.. 9.	Gadag	.. Do.
,,	.. 10.	Chikodi	.. Belgaum.
,,	.. 11.	Athani	.. Do.
1923-24	.. 1.	Bhusawal	.. East Khandesh.
,,	.. 2.	Raver	.. Do.
,,	.. 3.	Dhulia	.. West Khandesh.
,,	.. 4.	Nandurbar	.. Do.
,,	.. 5.	Nasik	.. Nasik.
,,	.. 6.	Kadwa Canal Development Association, Ojhar Tambat (Niphad Taluka).	Do.
,,	.. 7.	Satana (Baglan Taluka).	Do.
,,	.. 8.	Sholapur*	.. Sholapur.
,,	.. 9.	Walwa	.. Satara.
,,	.. 10.	Gokak	.. Belgaum.
,,	.. 11.	Indi	.. Bijapur.
,,	.. 12.	Mahim	.. Thana.
,,	.. 13.	Kalyan	.. Do.
,,	.. 14.	Alibag	.. Kolaba.
,,	.. 15.	Dapoli	.. Ratnagiri.
,,	.. 16.	Ratnagiri	.. Do.
,,	.. 17.	Rajapur	.. Do.
,,	.. 18.	Sirsi	.. Kanara.
,,	.. 19.	Karwar	.. Do.
,,	.. 20.	Hyderabad	.. Hyderabad (Sind).
,,	.. 21.	Hala	.. Do.
,,	.. 22.	Tando Allahyar	.. Do.
,,	.. 23.	Shahdadpur	.. Nawabshah.
,,	.. 24.	Larkana	.. Larkana.
,,	.. 25.	Kambar	.. Do.
,,	.. 26.	Sukkur	.. Sukkur.
,,	.. 27.	Ghotki	.. Do.

* Ekruk Tank Bagayatdar Sangh.

Year		Taluka		District
1924-25	.. 1.	Edlabad	..	East Khandesh.
,,	.. 2.	Sindkheda	..	West Khandesh.
,,	.. 3.	Junnar	..	Poona.
,,	.. 4.	Karmala	..	Sholapur.
,,	.. 5.	Hirekerur (Kod Taluka).		Dharwar.
,,	.. 6.	Hangal	..	Do.
,,	.. 7.	Karachi	..	Karachi.
,,	.. 8.	Jamesabad	..	Thar and Parkar.
,,	.. 9.	Digri	..	Do.
,,	.. 10.	Mirpurkhas	..	Do.
1925-26	.. 1.	Jalalpore	..	Surat.
,,	.. 2.	South Daskroi	..	Ahmedabad.
,,	.. 3.	Taloda	..	West Khandesh.
,,	.. 4.	Shahda	..	Do.
,,	.. 5.	Malegaon	..	Nasik.
,,	.. 6.	Karad	..	Satara.
,,	.. 7.	Bijapur	..	Bijapur.
,,	.. 8.	Haveri (Karajgi Taluka).		Dharwar.
,,	.. 9.	Umbergaon	..	Thana.
,,	.. 10.	Matli (Taluka Dero Mohbat).		Hyderabad (Sind).
,,	.. 11.	Mirpur Mathelo	..	Sukkur.
1926-27	.. 1.	Borsad	..	Kaira.
,,	.. 2.	Anand	..	Do.
,,	.. 3.	Pardi	..	Surat.
,,	.. 4.	Chalisgaon	..	East Khandesh.
,,	.. 5.	Erandol	..	Do.
,,	.. 6.	Chopda	..	Do.
,,	.. 7.	Amalner	..	Do.
,,	.. 8.	Yawal	..	Do.
,,	.. 9.	Sakri	..	West Khandesh.
,,	.. 10.	Nira Left Bank Canal Development Association, Baramati (Taluka Bhimthadi).		Poona.
,,	.. 11.	Wai	..	Satara.
,,	.. 12.	Koregaon	..	Do.
,,	.. 13.	Tasgaon	..	Do.
,,	.. 14.	Khatav	..	Do.
,,	.. 15.	Shikarpur	..	Sukkur.

Subsidies amounting to Rs. 33,344 have been paid to 42 of the above Associations during the year 1926-27. Subsidies to the following Associations were not paid during this year :—

1. Borsad.
2. Anand.
3. Pardi.
4. Chalisgaon.
5. Erandol.
6. Chopda.
7. Amalner.
8. Yawal.
9. Malegaon.
10. Sakri.
11. Sholapur (Ekruk Tank Bagayatdars' Sangh).
12. Karad.
13. Wai.
14. Koregaon.
15. Tasgaon.
16. Khatav.
17. Gadag.
18. Ron.
19. Dharwar.
20. Hangal.
21. Bijapur.
22. Haveri.
23. Mahim.
24. Kalyan.
25. Alibag.
26. Dapoli.
27. Ratnagiri.
28. Rajapur.
29. Sirsi.
30. Karwar.
31. Umbergaon.
32. Karachi.

Out of the 74 Associations, 69 have registered under the Co-operative Societies Act and the following five are yet to be registered :—

1. Chorashi
2. Jalalpore.
3. South Daskroi.
4. Pardi.
5. Ekruk Tank Bagayatdars' Sangh, Sholapur.

APPENDIX B

Summary of Work done at the Poona Agricultural College, for the year 1926-27

This is the nineteenth year of the existence of the College.

Staff

Except between 2nd May and 30th June 1927, Rao Bahadur P. C. Patil continued to act as Principal, in place of Dr. W. Burns, who was working as Joint Director of Agriculture. During the leave of Rao Bahadur P. C. Patil, Dr. W. Burns held charge of the Principalship for four days and Mr. V. G. Gokhale, the Acting Professor of Agriculture, for one month and 29 days.

Professor B. S. Patel, the Professor of Agriculture, went on eight months' leave from 27th March 1927, and Mr. V. G. Gokhale, the Deputy Director of Agriculture, Konkan, was appointed to act in his place. An additional post of a Lecturer in Agriculture, was created to which, Mr. K. H. Advani, B.Ag., M.Sc., is appointed.

Professor G. B. Patwardhan continued Acting Professor of Botany, throughout the year, except from 1st to 28th February 1927, when Mr. L. B. Kulkarni acted.

Dr. B. N. Uppal was appointed Plant Pathologist and Professor of Plant Pathology from 10th September 1926.

Rao Bahadur D. L. Sahasrabuddhe was Professor of Agricultural Chemistry throughout the year. He was confirmed from 3rd March 1926. Mr. N. V. Kanitkar, Assistant Professor of Chemistry, was appointed to act as Soil Physicist to Government, and Mr. V. G. Patwardhan was appointed to act in his place.

Dr. G. S. Cheema, the Professor of Horticulture, was on leave from 23rd November 1926 to 23rd December 1926, when Mr. H. P. Paranjpe, acted. Mr. H. P. Paranjpe was on two months' leave from 10th March 1927 to 9th May 1927, when Mr. P. G. Dani acted in his place. Mr. S. R. Gandhi, Demonstrator in Horticulture, resumed his duties from 6th June 1927, and relieved Mr. V. H. Kulkarni.

Professor J. P. Trivedi continued as Professor of Agricultural Engineering, Physics and Mathematics.

Mr. T. N. Jhaveri, continued to act as Assistant Professor of Entomology.

Examinations

Of the 46 candidates who appeared for the B.Ag. Examination in March 1927, 24 passed in the second class and 3 in the pass class.

Result of the Senior B.Ag., by Optionals (April 1927)

Optional	Students appeared	Passed in all subjects	Exempted in optionals
New Course			
(*a*) Intensive Study of Certain Crops ..	15	10	2
(*b*) Advanced Plant Breeding ..	4	4	....
(*c*) Advanced Agricultural Chemistry ..	1	1	....
(*d*) Advanced Animal Husbandry and Dairying.	1	1	....
(*e*) Advanced Agricultural Economics ..	9	5	4
(*f*) Advanced Horticulture ..	9	3	6
(*g*) Advanced Plant Pathology ..	1	....	1
Totals ..	40	24	13
Old Course Sr. B.Ag.			
(*a*) Agricultural Economics, etc. ..	2	2	....
(*b*) Advanced Botany ..	2	....	....
(*c*) Stock Breeding, etc. ..	1	....	....
(*d*) Advanced Entomology ..	1	1	....
Totals ..	6	3	....

Seventy-eight students appeared for the I.Ag. Examination. Of these, 3 passed in first class, 36 in second class and 9 in pass class.

At the final College examination for Diploma, ten students appeared, out of whom, four passed. Three students appeared for the I.Ag. Examination in Diploma, out of whom, one passed.

Students—(1927-28)

The following shows the number of students in the Senior B.Ag., and their optionals.

	No.
(*a*) Intensive Study of Certain Crops	19
(*b*) Advanced Plant Breeding	13
(*c*) Advanced Agricultural Chemistry	5
(*d*) Advanced Animal Husbandry and Dairying ..	5
(*e*) Advanced Agricultural Economics	8
(*f*) Advanced Horticulture	16
(*g*) Advanced Plant Pathology	8
Total ..	74

Junior B.Ag.

There are 50 students in the junior B.Ag. year

I.Ag.

The usual college census was taken at the end of June 1927. Seventy-seven students were on the roll made up as follows :—68 fresh students

(61 from Bombay Presidency including Sind and 7 from outside), and nine failed students, including men for Degree and Diploma.

Short Course

Men who wish to take one year's training in practical Agriculture coupled with a small amount of training in allied sciences are admitted to this Course. Nineteen students were admitted during the year.

A short course in Arboriculture was given to 13 officers from the Public Works Department.

Details

The details of the students for the year 1927 are as under :—

	No.
I.Ag. Class	77
Junior B.Ag. Class	50
Senior B.Ag. Class	74
Short Course Class	19
Total ..	220

Out of these 220 College students, 174 are from the Bombay Presidency. Forty-eight are from Deccan and Khandesh, 63 from Southern Maratha Country and Konkan, 44 from Gujarat and 19 from Sind. Of the remaining 46 students, 5 are from South India and Ceylon, 11 from Nizam's Dominions, 5 from Central India, 4 from Madras, 4 from Bengal and Assam, 2 from Goa, 4 from Travancore, 2 from Berars, 2 from Central Provinces, 4 from Ajmer and Udaipur, 1 from Mysore, 1 from Persia, and 1 from the Andamans.

The classification of students also shows that out of 174 students from Bombay Presidency (including Sind), 41 (23·56 per cent.) came from the four chief Agricultural communities of the Presidency, *viz.*, Marathas, Lingayats and Jains from the South and Patidars and Anavils from the North. One hundred students (or 57·47 per cent.) from the Brahmin community, 17 (or 9·6 per cent.) from the Mahomedan, 6 (or 3·4 per cent.) from the Christian, 10 (or 5·7 per cent.) from the Parsi, and 46 (or 26 per cent.) from other communities.

Library

The Library now has 13,013 Volumes. Out of these, 295 were added in the year 1926-27.

Visits

His Excellency the Viceroy and Lady Irwin together with His Excellency the Governor of Bombay, honoured the College by their visit on 31st July 1926.

The Marquis of Linlithgow and other members of the Royal Commission on Agriculture, visited the College, during October 1926.

The Right Honourable Shrinivas Shastri kindly presided at the Social Gathering of the College.

Shows

The First Presidency Agricultural Show, inaugurated by His Excellency Sir Leslie Wilson, was held in the Agricultural College grounds from 20th to 31st October 1926.

Rao Bahadur P. C. Patil, the Acting Principal, represented the College on Executive Committee. All the members of the Staff stationed at the College, worked hard for the Show. A large number of students worked enthusiastically as Volunteers. In appreciation of the services rendered by the staff and students, the Executive Committee of the Show awarded a gold medal which is kept on view in the Main Hall.

Athletic and Social Activities

The various departments of the College Gymkhana have been well patronised in their respective seasons as usual. We won the Inter-collegiate Tennis and Foot Ball Cups, this year, and won a few prizes in other games.

We contributed one platoon to the U. T. C., as usual.

The twin ideals of the College, Science and Sport continue to be pursued with the same zeal as before.

College Veterinary Hospital

The hospital continues to be very popular and the number of patients has increased since last year.

P. C. PATIL,
Acting Principal.

College of Agriculture,
Poona, 15th July 1927.

APPENDIX C

Summary of the work done under the Deputy Director of Agriculture, North Central Division, Nasik, for the year 1926-27

Staff and Organisation

The undersigned continued to be in charge of the Division throughout the year. Messrs. Bhole and Vaishampayan have been transferred to Poona on special duty. The Cotton Breeder, Khandesh, has been given two Graduate and one Non-Graduate Assistants, all being paid by the Indian Central Cotton Committee. With the addition of the staff, it is hoped that the work of the Cotton Breeder will develop soon.

2. In spite of the reorganisation of the staff as arranged during this and the previous year, it has been noticed that the staff is not sufficient to cope with the increased work. The activities of the Department have increased and the people too have begun to take interest into the work and to satisfy the needs of these cultivators, the staff is inadequate, especially in Nasik district, where there is only one Overseer. There is a variety of work which needs a man for itself. There is a great need for two Agricultural Graduates, one to tackle the problems of irrigated farming—both on canals and bandharas, and the other for land-bunding and embanking.

3. The Annual Staff Conference was held at Dhulia when all the members were present. In the Conference, the available results of the plots were discussed, and future line of work, as outlined on the results, was discussed. Several important subjects were discussed, chief amongst which were the better working of the Taluka Development Associations, Plot work, etc.

4. Mr. G. S. Moghe was in charge of management of boring work in addition to his own duties as Farm Superintendent, and has worked well in both capacities.

5. *Peculiarities of the season.*—Rainfall during the year was, in general, below normal, and was not well distributed. Special features were—

It commenced a month later than usual. Kharip sowings were started in the beginning of July.

Rainfall in July was good.

Rains in August were heavy and continuous, which affected the growth of crops. There was no time owing to continuous rains, for intertillage and weeding operations. The fields were full of weeds and crops were pale.

Rainfall in September was very scanty, after which there was no rain.

In some Talukas, Shahada and Taloda, and in other heavy soil tracts, the kharip sown crops had to be removed and the fields were prepared for rabi crops.

The yields of kharip crops were below normal, except that of jowar and bajri and owing to failure of late rains, the harvest of rabi crops was rather poor.

6. *Diseases.*—Cotton crop was attacked by leaf-eating caterpiller.

Dry wheat was attacked by stem-borer and irrigated by rust in certain localities.

Chillies were damaged by leafcurl disease and onions by thrifts. In Trans-Tapti, some damage was done by locusts. The damage was on 200 acres only.

Research and Experiment

7. *Cotton Crop Improvement.*—With the sixth year, the work of Cotton Breeder, which simply consisted in selection from the supposed Bani-Comilla hybrid, has taken a new phase. The work consisted in finding out a type approaching the yield of N. R. and having better staple both in length and quality and higher ginning percentage.

8. As reported in the last year's report, trial to BXX27 (Dhulia No. 1) was given on a large scale on Jalgaon Farm, and in Khandesh districts. The rainy season of this year was peculiar. The continuous wet weather of August affected the growth of BXX27, the lower leaves turned yellow and dropped down. This seems to have reacted on the yield. The effect was more marked in heavy rainfall tracts and also on soils that were very deep and retentive. The yield of BXX27 on the Jalgaon Farm was less by 10·5 per cent. than the mixture of N. R. for the year under report, the outturn per acre being 541 lbs. and 605 lbs. respectively. But it was found that though the yield of seed cotton is less, yet it is capable of giving as much lint yield per acre as that of N. R. Not only this, but the lint fetches better price than that of N. R., the increase obtained being from 3 to 7 rupees per palla of 240 lbs.

9. Another promising strain—BXI9(34) (Dhulia No. 2)—was tried on 4 acre plot on Jalgaon farm. The outturn of this strain was 595 lbs., as against 605 lbs. of N. R.

In view of the above results, it has been decided by the Cotton Committee, Khandesh, to multiply BXX27 on thousand acres during the coming year, the grounds being "that there is not evidence to condemn the Dhulia No. 1 (BXX27) cotton entirely but that on the other hand, the results at Amalner and Utran, as well as on Jalgaon Farm, indicate that there is a distinct reason to believe that the new types may be at least as profitable to the grower as N. R. cotton."

The only other type which seems to the Committee to have present promise is Dhulia No 2 [BXI9(34)], and it was decided that this should be tested in replications on a fairly large scale at Dhulia and Jalgaon this year on the BXX27 and N. R. On canal areas all the three types be tried at several centres.

10. The work of finding out high yielding strains in Neglectums is continued. Four strains have given so far good results, but further trials are necessary.

Hybridisation.—As stated in the last year's report, the work of crossing was undertaken with the object of combining yield, ginning percentage and staple. The crosses recommended were (I) B1 × 29 and (II) BXI 9 (34) × Comilla.

Farm and Experimental Station Work

11. (*a*) *Jalgaon Farm, East Khandesh.*—The following average crop yields per acre were obtained on Jalgaon Farm during the year under report:—

Cotton, 126 and ¾ acres	.. 607 lbs. of seed cotton.
Groundnut, 23 acres and 24 gunthas	.. 1,495 lbs.
Jowar and Udid, 23—	
Jowar	.. 2,156 lbs.
Udid	.. Failed owing to continuous rain.
Wheat 15½ acres	.. 512½ lbs.
Gram 2¾ acres	.. 870½ lbs.
Coriander 1 acre 26 gunthas	.. 276 lbs.

12. The yields of cotton and groundnut of this year are lower than the average of the farm, due to the peculiar season. But these yields are better than those obtained by the cultivators in the District. The cotton and groundnut yields in the district were low owing to the continuous rains in August and insufficient in September and then no rain later on. Better tillage counts for the higher yields on the Farm. The yield of 2,156 lbs. of grain of Jowar obtained per acre has broken the record of all the previous years on the Farm since it was started.

In spite of the bad rabi season, the yields of wheat and gram obtained on the Farm are good when they had practically failed in many localities, while in others, gave a very poor crop. This is mainly due to the proper and timely tillage operations to save the moisture.

13. The investigation work on Cotton Manuring was continued this year. The use of castor cake as manure for cotton is being taken by the people and all the Taluka Development Associations have taken up the work of its extension. As reported in the last year's report, the investigation work of finding other useful substitutes was continued this year. Amongst the manures tried, the following manures and mixtures are showing good prospects when compared with a dose of 300 lbs. of Castor cake:—

(1) Groundnut cake 200 lbs. *plus* Nitrate of soda 50 lbs.

(2) Groundnut cake 200 lbs. *plus* Sulphate of ammonia 40 lbs.

(3) Nitrate of Soda 150 lbs.

(4) Amophos 80 lbs. In case of Amophos the dose of castor cake was 400 lbs. per acre.

(5) Seven cart-loads of farmyard manure *plus* 40 lbs. of sulphate of ammonia.

Besides these, several other manures and fertilisers of different Firms were tried. These fertilisers were found to be uneconomic. In the case of the above manures, the trials on Amophos and Nitrate of Soda 150 lbs.

per acre were continued for over three years. In both cases it is found that the yield obtained is more but in the case of Nitrate of soda the cost of manure is not covered by the extra yield obtained with the present rates for seed cotton, and unless the cotton fetches better prices, it will not prove an economic manure. Nothing can be said of Amophos, since the rate of manure is not yet known. Out of the two grades, 13/48 grade seems to be better than 20/20 grade.

14. The Trustees of the Sir David Sassoon had sanctioned a grant of Rs. 5,000 to find out suitable manuring for cotton in Khandesh. The manures which had shown prospects of being useful on the farm were tried in the districts of Khandesh. Though the season was not favourable for the crop, still the groundnut cake mixed with sulphate of ammonia or nitrate of soda had shown better results and show signs of being useful. The same mixtures are being tried this year in districts. Our thanks are due to the Trustees of the Fund for helping the cause, and hope that the grant will be continued till the problem is fully solved.

15. The dose of manure per acre has been ascertained. But further trials are necessary to find out if these will prove economic in a normal season. Looking to the results of the last three years, it is expected that some good results can be achieved and some suitable manures can be found out after few more trials. Trials of these manures will be continued.

16. *Groundnut.*—The seed imported from America before four years continued to give more yield than the local seed, the increase being of 100 lbs. this year. But this year no marked difference is seen in the size of the pods, pods from newly imported seed from local seed being of the same size. It seems that after four years the seed has been acclimatised, and though it gives increased outturn, the size of the pods is reduced to local size. The pods have been reserved for seed purposes only.

17. The trial of proprietary manures was continued. The groundnut mixture of Dharamsi Morarji has given good results and are found to be very useful. The dose recommended by the firm seems to be a bit high, still it pays to use it. The dose recommended is 4 cwt. per acre.

The yield on the farm was very good, as compared with the yields obtained in the district.

18. *Wheat.*—The trial of testing the six wheat strains on a small scale for the Crop Botanist, Poona, was continued this year. Strain No. 224 alone, like last year, has given better yield than Bansi, the local wheat, and seems to be the only strain which needs further trial on a larger scale.

19. Experiments with wheat, as reported last year, were continued with an addition of packing the soil before sowing. The experiments conducted during the year were—

(1) Wheat rolling.
(2) Double row system of sowing wheat.
(3) Packing the soil before sowing.

The results obtained show that there are prospects of these being useful but need further trials which will be continued this year.

20. In order to find out suitable implements to harvest groundnut, trials were given to several implements like potato digger and it was observed that the digger, with some modifications, may prove useful. The Agricultural Engineer is requested to work out the modifications.

21. *Khed Nursery.*—The nursery has continued to do good work and the results obtained have shown the people the usefulness of maintaining their own nursery. Two men have come forward to have a separate nursery on their own plots and it is expected that one or two more nurseries will be started soon. During this and last year 1,351 plants of santra, 212 plants of mosambi, and 53 plants of figs were ready for sale. All the plants of the last year have been sold, while for this year's plants there is a demand which will be disposed of soon.

This year's results also corroborate the results of the last year, and it has been found that the suitable time for budding in Dhulia taluka is from January to March. Nine hundred seedlings are ready for budding and the work of budding will be taken in January.

22. In addition to this work, the Horticultural Fieldman attended the pruning of grapes and santra plants in the district and treated mango plants successfully for borer. The Agricultural Overseer has created a liking for fruit culture amongst the people in Nawapur and Nandurbar talukas and has arranged for planting 32 mango grafts and 70 santra plants.

23. *Belgaum Experimental Plot.*—The work on the plot was restricted to the trial of—

(1) Bajri, nagali and wheat varieties.
(2) Manuring of onions.
(3) Trials of groundnut in comparison with bajri.
(4) Trial of new crops like potato, etc.

Bajri.—It seems that, under the prevailing conditions, awned bajri is giving better returns.

Nagali.—The imported varieties are not coming up in yield. New seeds will be obtained and tried for the purpose.

Wheat.—Pusa No. 4 has shown better results.

24. The following manures were tried for onions:—

(1) Nitrate of soda .. .. .. 200 lbs. per acre.
(2) Calcium cyanamide .. .. 112 lbs. per acre.
(3) Castor cake .. .. .. 300 lbs. per acre.
(4) Green manuring with san.

All the fertilisers have given more yield but nitrate of soda tops the list.

This is the first year of trial of calcium cyanamide for onions, wheat and the results so far obtained show that the manure may prove useful. Further trials with this manure are necessary.

25. It has been found that crops like potatoes can be successfully grown in the locality. Efforts will be made to introduce the crop in the locality.

26. Trials with spacing in growing onions for seed were laid down and 18" spacing has given more yield.

District work

27. This work cannot be described in details, owing to limited space allotted for the purpose. The work consists of—

(1) Continuation and verification of results obtained in previous years.

(2) Trial of new fertilisers—Calcium cyanamide, etc.

(3) Popularising the Akola bajri, Pusa wheat, castor cake, as manure for cotton, sulphate of ammonia for sugarcane and rice, nitrate of soda for onions and garlic.

(4) Trial of wheat strains of Crop Botanist.

(5) Trial of wheat scheme in Trans-Tapti area.

(6) Working out fodder storage schemes.

(7) Special inquiries on crops.

Private individuals, Officers of Revenue and Co-operative Departments and Taluka Development Associations continued their help in this work.

28. Following are the crops, with which experimental work was continued :—

(1) Cotton :—

(1) Manurial experiments with groundnut cake *plus* nitrate of soda.

Groundnut cake *plus* sulphate of ammonia.

Seven cartloads of farm yard manure *plus* sulphate of ammonia.

Proprietary manures.

(2) Trial of new strains, namely, BXX27 and BX1 9(34).

From the results obtained during the year, it can be said that following manures and mixtures are promising but the experiments will have to be continued to corroborate the results.

(1) Amophos—dose of 80 lbs. per acre.

(2) Groundnut cake 200 lbs. *plus* nitrate of soda 50 lbs.

(3) Groundnut cake 200 lbs. *plus* sulphate of ammonia 40 lbs.

(4) Farm yard manure 7 cart-loads, *plus* sulphate of ammonia, 40 lbs. as top-dressing after 6 weeks.

(5) Castor cake, 300 to 400 lbs. according to rainfall condition.

The experiments with these manures were tried in several places in all districts of this Division.

29. *Wheat.*—This is an important crop of Trans-Tapti talukas of the West Khandesh, and a scheme to improve the cultivation and seed supply was laid down. The season for the dry crop of wheat was not favourable

and the yield in general was much below normal. In spite of the season, the results obtained give hope of getting some useful suggestions in wheat cultivation. The same scheme will be continued next year.

The strains of the Crop Botanist were tried in West, East Khandesh, and also in Nasik districts. Two of the strains show some prospects of being useful but this needs further trial. In Nasik district the strains were attacked by rust which was grown as a dry crop. For irrigated wheat, trials were arranged with nitrate of soda 150 lbs., calcium cyanamide 100 lbs., castor cake 300 lbs. and mixture of castor cake 300 lbs. sulphate of ammonia 112 lbs. and superphosphate 224 lbs. per acre. The results obtained this year are promising and show of economic value. This is the first year of calcium cyanamide and trials will have to be continued. The mixture gives the highest yield but dose seems to be a bit high, and needs trials to find out if it can be reduced. Further corroborative trials will be arranged next year.

30. The varietal trials in Nasik and Khandesh districts have shown the superiority of Pusa Nos. 4 and 12, being high yielders and rust resistant. Under irrigation, the demand for these is on an increase and the results obtained are in favour of double sowing in irrigated wheat. This will be tried next year again.

31. In irrigated wheat single and double sowing were arranged.

32. *Rice.*—The work done is on three lines, namely—

(1) Use of sulphate of ammonia as rab substitute.

(2) Trial of sulphate of ammonia, amophos, and castor cake, as field manure.

(3) Introduction of better variety like Kolumba No. 42.

In addition to these, trial plots were laid down on Bandharas in Sakri taluka to see if the seed rate can be reduced with advantage.

The use of sulphate of ammonia as rab substitute has been appreciated in Nasik district and the quantity purchased by the people was over 7,000 lbs. for this purpose only.

400 lbs. castor cake per acre as field manure has again shown that it increases the outturn on Bandharas in West Khandesh. Amophos has again given better yields, but it cannot be said whether it is an economic manure, since its selling price is not known.

33. Kolumba No. 42 which is being tried for the last three years, shows that it is high yielder but the yield goes down with the period. It seems that the seed will have to be replaced after three years, but this needs further trials, which will be arranged in the next year.

34. The results of experimental plots show that the seed rate can be reduced to two-thirds of the present seed-rate, but this is the first year and needs confirmation.

35. *Chillies.*—The dose of 400 and 600 lbs. of Castor cake, per acre continued to give increased outturn, the increase in yield this year being from 400 to 700 in the case of 400 lbs. dose and 800 to 1,200 for 600 lbs. dose.

The cultivators have appreciated the value of this manure and are taking it up now.

36. *Groundnut.*—The groundnut mixture of Messrs. Dharamsi Morarji has given better results. This mixture is tried for the last three years and the results are promising. The mixture is found useful and economic.

37. *Sugarcane.*—The cultivators in Nasik and West Khandesh are convinced of the merits of wide planting and of using sulphate of ammonia and cake as top-dressing and have taken up the system. In Sakri taluka the area under wide planting has been increased by 60 per cent. Sulphate of ammonia as top-dressing is now used on a large scale in Nasik and West Khandesh, the sales being over 75,000 lbs. worth Rs. 7,500.

Arrangements to supply sets for dry cultivation in Igatpuri taluka of Nasik district have been made.

Trial of S. 48 in comparison with Khadya cane and of D. 109 and H. M. 510 in place of Pundya have been arranged.

38. *Onion and Garlic.*—Nitrate of soda has continued to give better yield in Nasik and Khandesh districts, with the recommended dose of 200 lbs. per acre. The use of this manure is extending and the sales this year in Nasik district were over 9 tons.

Calcium cyanamide was tried this year for onions and garlic in comparison with nitrate of soda and farm yard manure. The results are in favour of cyanamide but the trials will have to be continued, this being the first year of the experiment.

Newly introduced crops—Potatoes have continued to give good results and as a result the area in Nasik district is increasing.

Miscellaneous

39. The work on improvement in local implements has not far advanced but arrangements have been made to get some implements which will be of great use.

40. A special grant of Rs. 1,400 was placed at the disposal of the Deputy Director to demonstrate the advantages of using chaff-cutter to save fodder. Nearly 18 hand power chaff-cutters were put in the Division for demonstrations. Several demonstrations were held by the Departmental and Taluka Development Association Officers. People have appreciated the usefulness of the chaff-cutters but complained of power required in chaffing the kadbi, which is rather hard in East Khandesh, is more and the labourers get tired soon with the hand machines. Labourers refuse to work hand power chaff-cutters, as they found it to be a hard work. To remove the difficulty a portable power chaff-cutting plant was erected at a cost of Rs. 2,100 and trials were given. An ordinary kamgar was trained to work the machine and it is gratifying to note that the work done was very satisfactory, with a result that the cultivators came forward to get their kadbi chaffed on payment.

The above plant runs at a daily cost of Rs. 10 including depreciation at 10 per cent. and interest at 6 per cent. and cuts kadbi 8,000 lbs. The cost of chaffing kadbi comes to Rs. 1-4-0 per 1,000 lbs. The cost is much cheaper than that of hand labour where it works out to be little over Rs. 2 per thousand pounds. It seems that such plants will be useful. Further trials will be arranged next season.

41. In addition to the propaganda and experimental work, the District staff had attended to the work of following inquiries:—

(1) Groundnut mixture in Khandesh.
(2) Wetting of groundnut.
(3) Occurrence of castor cake in cotton seed.
(4) Survey of backward area of Nandurbar and Taloda talukas.
(5) Demonstration of chaff-cutters.

42. *Groundnut mixture in Khandesh.*—Khandesh groundnut is fetching better price in the market, but a report was received from Messrs. Ralli Brothers about the occurrence of Small Japan (red-seeded variety). The inquiry was taken up since the mixture fetched lower prices. As a result of this inquiry it was noticed that there is a mixture of red-seeded variety, but the percentage of mixture was from 3 to 10 in different localities, Jamner having higher and Chalisgaon lowest. The mixture is due to (1) people getting presents known commonly as "Wanola" which at times is used as seed, and (2) using mixed seed. Attempts are being made to induce people to sow pure seed.

43. *Wetting Groundnut.*—A complaint about watering unshelled pods and sending these to markets was received. As there was every possibility of getting low prices for such produce and also losing the name for the superiority of the produce, the inquiry was taken in hand. From the information collected it is seen that no such practice of wetting the pods exists in the Khandesh districts, but in oil mills the pods are washed to remove mud and dried before they are crushed. These pods never go to market.

44. *Occurrence of Castor Seed in Cotton Seed.*—On inquiry it was noticed that no such mixture occurs in this Division. It was noticed in only one godown in Nandurbar, district West Khandesh, where the bags of each were stored side by side. This was unintentional.

45. A survey of the backward areas, which is mostly populated by the Bhil cultivators, was undertaken with a view to line out the work in the tract.

Propaganda

46. The work of the Divisional Board of Agriculture was handed over to the Assistant Registrar, C. S. from November 1926, as per new arrangements.

Taluka Development Associations

47. Much progress has been made in the organisation of Taluka Development Associations, and at the end of this year there are now

20 Associations working in this Division. All of these have been registered under Co-operative Societies' Act and are getting Government subsidy. Proposal for the registration of one for Yeola Taluka has been submitted to the Divisional Board for its approval and recommendation. Nearly two-thirds of the tract is being worked with the help of the non-official organisation for agricultural, co-operative and social development. Details of all the activities of these associations cannot be given for want of space. The main lines of work, as reported in last year's report, are being continued. But some of the Associations have taken up additional works, as shown under :—

Jalgaon Association—Purchase and storing of grass. Arrangements are being made to start a Cattle Breeding Farm.

Raver Taluka D. Association—Stocking kadbi as a reserve for famine

Bhusawal Association .. (1) Stocking kadbi as a reserve for famine.
(2) Supply of breeding bulls.
(3) Supervision work of Co-operative Credit Societies, by appointing a Supervisor for the work.
(4) Organisation of a cattle farm.

Pachora Association .. (1) Organisation of Cattle Breeding Society.
(2) Supervision of Co-operative Credit Society, by appointing a Supervisor specially for the work.
(3) Attempts are being made to organise a Land-mortgage Bank for Pachora Taluka.

Dhulia Association .. Supervision of Co-operative Societies.

48. The implement and the other depots started by the Department have all been handed over to the Associations in their area and the work done by all these Associations is satisfactory.

49. Statement below will show the amount collected by the Associations and main items of expenditure.

Name of T. D. A.	Balance *plus* Amount Collected	Government subsidy	Amount spent					No. of plots arranged for	No. of Demonstrations held
			Establishment and office	Implements, etc.	Manures, Seeds, etc.	Demonstrations	Other charges		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
Nasik ..	8,080	1,000	1,130	782	2,822	93	4,253	25	3 big. 18 small
Kadwa Canals ..	2,435	1,000	623	761	2,296	199	148	32	14
Satana ..	..	1,000	927	1,805	1,733	27	10	30	4
Dhulia ..	7,847	1,000	2,024	567	375	38	197	10	2
Nandurbar ..	1,914	1,000	671	122	444	50	1,677	17	3

Name of T. D. A.	Balance *plus* Amount Collected	Government subsidy	Amount spent					No. of plots arranged for	No. of Demonstrations held
			Establishment and office	Implements, etc.	Manures, Seeds, etc.	Demonstrations	Other charges		
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
Taloda ..	620	1,000	189	..	10	..	26	10	..
Sindkheda ..	4,301	313	539	278	1,290	37	110	24	12
Sakri ..	1,632	..	..	Newly Started.		..	..	..	..
Bhusaval ..	4,201	1,000	1,103	168	377	151	1,710	14	24
Edlabad ..	938	500	375	32	32	..	748	16	40
Jalgaon ..	11,676	1,000	1,911	431	3,158	154	113	32	55
Pachora ..	16,438	1,000	2,209	382	2,796	..	5,484	33	20
Raver ..	8,596	1,000	1,648	2,606	110	34	176	67	37
Shahada ..	..	1,000	..	..	..	..	..	..	..
Malegaon ..	Newly started.								
Chopda ..									
Amalner ..									
Erangol ..									
Chalisgaon ..									

50. The new arrangement of collecting subscriptions through village officers on commission basis is proving useful, and most of the associations have taken recourse to this system. The great advantage is that the fieldman of the Association is liberated for his legitimate work, otherwise most of his time was spent in connection with this work. The question of finance is a great hindrance in the better working of these Associations. This can be avoided if there is full support of Revenue officers and of Local Boards. To achieve all the objects, the present staff will be inadequate, and unless the yearly income goes up to Rs. 3,500, the Associations cannot work out all the schemes laid down in their bye-laws.

Non-Credit Work

51. As a result of the propaganda done last year, Mr. Khanvilkar, the Agricultural Overseer, Sakri, has organised the Fencing Society at Dhadne, which has been registered and the erection work of the fence is in progress.

52. Mr. W. D. Salunke, Agricultural Organiser, Malegaon, has organised the Manure and Seed Society at Dabhadi, which has been registered and has now begun its work.

53. The Mhasrul Seed Society has been put in working order by Mr. Prabhune, District Agricultural Overseer, Nasik.

54. Niphad Taluka Onion Sale Society has been organised with the help of Mr. Prabhune, which is registered under Co-operative Act. The Society has begun its work from this season.

55. *Departmental Work.*—A demonstration on a bigger scale was arranged at Dhadne to demonstrate the improvements in sugarcane cultivation and in gul-boiling. Mr. Knight, Collector of West Khandesh, presided over the deliberations and nearly 500 cultivators attended the demonstration. In addition, there were four more major demonstrations arranged at the time of Co-operative Conferences at Neri in Jamner Taluka, Warangaon in Bhusawal taluka, Pachora in Pachora taluka, and Chopada in Chopada taluka. There were 80 crop, 180 implement, nearly 125 of steeping of jowar, and 2 gul-boiling demonstrations in this Division. Some of these were arranged at the time of the Jamabandi. Over 18,000 people attended the demonstrations.

56. In these demonstrations working of iron ploughs and levellers, steeping of jowar in copper sulphate solution, use of different manures were successfully demonstrated. The chief items in crop demonstrations were better manuring for cotton, rotation in cotton cultivation, wide planting and use of sulphate of ammonia in sugarcane cultivation, use of nitrate of soda for onion, garlic and irrigated wheat, etc. Advantages of growing improved strains in N. R. cotton, Akola bajri, Spanish peanut, and Kolumba No. 42, were demonstrated.

As a result of these demonstrations, implements worth Rs. 7,200, manures worth Rs. 11,000 and seeds worth Rs. 2,000 were purchased by the cultivators. The results of steeping in copper sulphate demonstration was a sale of packets over 10,000.

57. Though this is an important item in propaganda, the grant allotted is inadequate and it restricts the work. This seems inadvisable, as a chief object of propaganda is to take to the house of cultivators, the recommendations of the Department and plot and implement demonstrations on the fields of the cultivators are the means for it. However small they may be, it needs expenses to carry implements from place to place to show to the people the advantages of these implements if used.

Service

58. *A. Extension of N. R. Cotton.*—This work was done through the same agencies as were reported last year.

The first class seed produced on the farm was 20,000 lbs. due to small area on the farm. This was distributed to 16 Taluka Development Associations, one Co-operative society, two Co-operative Banks in the Division and nearly 2,500 lbs. used for experimental plots. To supply the increased demand for N. R. seed, nearly 570 acres on cultivators' fields were purified and ginned under the supervision of departmental *kamgars.* The total quantity of seed distributed of 1st, 2nd, and 3rd class seed, both in and out the Division, is 2,96,000 lbs. Besides this, many cultivators get the purification work done either through the fieldman of the Association or of Department, and sell it. The approximate area may be nearly 2 lacs under this crop, but it is not in a concentrated block. Attempts are being made now to concentrate the area.

59. *B. Extension of Akola Bajri Seed.*—The importance of this seed has been noticed by the cultivators and the demand for this seed is increasing. Seed worth Rs. 600 has been distributed during the year.

60. C. *Implement Depots.*—The departmental depôts were maintained at 10 places as against 12 in the last year, since this work has been taken over by the Taluka Development Associations which maintain their own depots in their areas. These depots serve to provide implements on hire, sell manures, seeds, etc. The hire received during the year was over Rs. 665 as against Rs. 458 of last year. These depôts the popular amongst the cultivators, inasmuch as they serve the centre of information as well as supply their demands of seeds, manures, etc.

61. *Presidency Show at Poona.*—As a result of propaganda, over 3,000 people attended the Show. The North Central Division contributed a sum over Rs. 20,000 to the Show Fund. Six officers from the Division worked as demonstrators in the Show. Over 500 exhibits for which 94 prizes were given. The prizes were—

3	Gold medals.
1	Silver medal.
21	Bronze medals.
69	Cash prizes of different value.
94	

62. As a result of this grand Show, nearly 90 Bulsar rahats (Persian wheels) and a number of iron mots and ploughs were purchased by the cultivators. The demand for concentrated manure also has been increased. Over and above this, it has created a liking amongst the people for agricultural improvement.

63. *Crop Protection.*—The trouble from wild animals, especially from pigs, is on increase, and the damages reported from certain tracts are heavy. The line of work done during the year under report continued on the same lines reported in the last year's report.

64. A fencing scheme at Dhadne has been organised at a cost of Rs. 6,000 and the work is in progress. Two demonstrational fences in Nasik District are in the process of erection. Four licenses were recommended and given during the last year. The effect of pig-poisoning was not so marked, as the arsenic obtained was of a lower quality. But this was good for jackals and rats, the trouble of which was of a serious nature in Nasik District.

65. If the work done is to be judged from an extent of adaptation of the suggestions, it can be said that the improvements described in last year's report as taken by the cultivators, are on increase.

In spite of the unsatisfactory season, over 150 iron ploughs and mots, were purchased by cultivators, which had already been described under Demonstrations. The demand and purchase of concentrated manure

for sugarcane, onions and garlic, has increased by nearly 20 per cent. Insecticides were used on a larger scale and were purchased by cultivators.

N. R. cotton is much liked now and there is a large demand for the seed both in and out of the division.

Akola bajri and Pusa wheats have become popular and demand for its seed is increasing. We have gained faith of people who are now coming with problems for help.

66. *Work in Dangs.*—A special Kamgar of Bhil caste was appointed last year for this work. The line of work is—

(1) Improvement of rice land and rice cultivation.
(2) Improvement in Nagli cultivation.
(3) Advantages of cutting grass in proper time.
(4) Storing green grass in silo.
(5) Storing manures in pits.
(6) Demonstration of improved implements.
(7) Trial of Spanish peanuts.

The work of the fieldman is supervised by the Dewan of Dangs. He has put embankments to 102 rice fields in 25 places, arranged for nearly 400 pits to preserve farmyard manure, arranged for 2—3 silos in each range. The area under superior variety of Nagli and Spanish peanut is increasing. The Kamgar's work has been reported to be diligent, devoted and dutiful and has discharged his duties ably in isolated, unhealthy and unpleasant tract like Dangs and deserves recognition. Bad climate allowance has been recommended and it is hoped that it would be sanctioned from the beginning of his service.

67. *Mechanical Assistants.*—The Mechanical Assistant was on leave for five months during the year under report and his post was vacant. Before he went on leave, he was entrusted with the work of repairs to the engine of boring machine.

During the year, two erection works, *viz.*: (1) Portable chaff-cutter and (2) Pumping plant on Dhulia School Farm, were completed. Survey of two pumping sites in Nasik District was taken up and estimates were prepared and supplied to cultivators. He has prepared a map showing all the departmental activities in the North Central Division for the Presidency Show.

68. *Boring Work.*—Mr. Moghe, Superintendent, Jalgaon Farm, is supervising the work of this section in addition to his own duties. It is found necessary that to get good work, supervision on the spot was necessary. As the Boring Assistant was on leave Mr. D. M. Sitole was given charge, and he worked for five months, when Mr. Agashe returned from leave. During the acting period, Mr. Sitole has done good work. The work is well organised and the working is satisfactory.

69. All the three machines till the end of May, were working in the Khandesh districts. The work turned out during the year was satisfactory, as will be seen from the statement. The total footage bored in this year was 1,289 feet against 375 feet in last year. In all 26 bores were undertaken out of these 16 are successful, 8 unsuccessful and 2 are in progress. The majority of idle days were on account of some machanical trouble, or breakage of parts of the machines which could not be replaced, being not available with the manufacturers also. Such delay is quite unavoidable as long as manufacturers do not stock spare parts.

The statement of particulars of bores made in the North Central Division from 1st July 1926 to 20th of June 1927, together with the cost of bores, etc., is enclosed as Appendix A.

70. *Education.*—There was no change in the working of Agricultural School, Dhulia. The total number of students undergoing the course was 32, 16 being in the second year and 16 in the first. Taken by districts, the number of students was—

East Khandesh	9
West Khandesh	14
Nasik	9
	32

and, by caste,

Mahrattas	11
Other Backward Classes	11
Brahmins	9
Mahomedan	1
	32

71. The annual examination was held by Mr. N. V. Bhagwat, Cotton Supervisor, and Mr. G. S. Moghem, Superintendent, Jalgaon Farm. Thirteen students have passed in the final year, and 10 in the 1st year. The examiners have remarked that—"The boys were quite able to work the implements but were unable to explain well, certain minor adjustments, such as adjusting the depth and width of the furrow, etc.

The answers given at the time of the oral examination were not satisfactory. On the whole, the working of the School seemed satisfactory, and the students were found trained in all the branches of work which are necessary for such agricultural schools."

72. During the year, a small poultry-yard has been added to the equipment and will prove useful to the students as a training ground for secondary occupation.

73. A pumping plant has been erected and this addition will prove very useful in increasing the irrigation facilities as well as in training the boys in working of engines and pumps.

74. Rs. 3,128 were collected by the Local Committee of the School from District Boards, Municipalities, Sassoon Trust Fund and Taluka Development Associations in the North Central Division. The sum is employed to defray the boarding expenses of the students.

75. No student took advantage of the course in farm management and economics, instituted at Jalgaon Farm.

76. There are eight Agricultural bias classes in this division, and necessary advice on cropping, etc., is being given by the district staff.

The schools are—

(1) Ozar, (2) Dabhadi, and (3) Sukene in Nasik District, (4) Asoda, (5) Wagali, (6) Thorgavan, (7) Bhalōd in East Khandesh, and (8) Kusumbe in West Khandesh.

77. His Excellency the Governor of Bombay paid a visit to two Institutions, *viz.*, Jalgaon Farm, and Dhulia School, in the month of September 1926. His Excellency took keen interest in the working of the institutions and inquired into the details of work that is being done on the Farm as well as the work done by the boys.

The sympathy and co-operation shown by the officers of other departments continued this year and is acknowledged before closing the report.

K. M. PAWAR,

Nasik, 2nd August 1927. Deputy Director of Agriculture,
N. C. D., Nasik.

Statement of particulars of Bores made by the Boring Assistant, North Central Division, Jalgaon, in 1926-27 from 1st July to 30th June 1927

Serial No.	Name of well owner	Name of Taluka	Name of Village	Diameter of bore	Depth of boring	Water before boring in gallons per hour
1	Mr. D. M. Phadke ..	Bhusawal ..	Vadoda ..	3"	47'—8"	
2	,, Vajirkha Kalekha..	,, ..	Sakegaon ..	3"	100'—0"	
3	Bhagirath Mill, Jalgaon.	Jalgaon, East Khandesh.	Jalgaon ..	3"	25'—6"	Two motes working for 4 hours.
4	,, ,, 2nd bore..	,, ..	,, ..	3"	21'—6"	
5	,, ,, 3rd bore..	,, ..	,, ..	3"	60'—0"	Surface bore.
					97'—0"	
6	Mr. B. K. Deshmukh, Pleader.	,, ..	,, ..	3"	67'—6"	One mote working for 6 hours.
7	,, K. H. Bhole ..	,, ..	Asoda ..	3"	95'—0"	Do. ..
8	,, K. H. Baud ..	Nandurbar ..	Ranala ..	3"	69'—0"	One mote working for 4 hours.
9	,, ,, 2nd bore..	,, ..	,, ..	3"	80'—0"	One mote working whole day.
10	,, Punja Bhiwa Mahar.	,, ..	,,	3"	50'—0"	One mote working for two hours.
11	,, P. N. Khunte ..	,, ..	,, ..	3"		
12	,, Suka Shivaji Shinde.	Raver ..	Thorgawan ..	3"	63'—0"	One mote working for two hours.
13	,, ,, 2nd bore ..	,, ..	,, ..	3"	63'—0"	One mote working for whole day.
14	,, Shankar Govinda Zope.	,, ..	,, ..	3"	25'—6"	One mote working for two hours.
15	,, Tapiram Bhagwan Chaudhari.	,, ..	,, ..	3	75'—0"	Do. ..
16	,, Hirachand Ganu Shinde.	,, ..	,, ..	3"	45'—0"	One mote working for two hours.
17	,, ,, 2nd bore.	,, ..	,, ..	3"	41'—0"	Do. ..

Water after boring in gallons per hour	Departmental charges	Labour charges	Total cost	Cost per foot	Result	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
	85 8 9	150 0 0	235 8 9	3 5 0	Failure ..	18 feet work done this year.
	154 12 0	Information regarding labour charge is not yet received from the owner.			Do. ..	23 feet work done this year.
Two motes working for whole day.	15 8 0					
	21 8 0	365 13 3	553 15 3	5 11 4	Successful.	
Sufficient for Myer's pump.	151 2 0					
Two motes working for whole day.	113 8 0	Information regarding this is not yet received from the owner.			Do.	
More than two motes working for whole day.	137 2 0	Do.			Do.	
One mote working whole day.	87 8 0					
Two motes working whole day.	123 8 0	460 11 3	671 11 3	4 8 2	Do.	
One mote working for whole day.	77 0 0	226 4 0	303 4 0	6 1 0	Do.	
						In progress.
One mote working for whole day.	63 0 0	132 0 0	195 0 0	3 1 6	Do.	
Two motes working whole day.	136 8 0	183 0 0	319 8 0	5 1 1	Do.	
	51 8 0	Information not yet received from owner.			Failure ..	Rejected as tool could not work further.
Two motes working for whole day.	136 1 6	95 0 0	231 1 6	3 1 3	Successful.	
	Nil.				Failure ..	Rejected as tool could not work further.
One mote working for whole day.	59 0 0	50 4 0	109 4 0	2 9 8	Successful.	

Serial No.	Name of well owner	Name of Taluka	Name of Village	Diameter of bore	Depth of boring	Water before boring in gallons per hour
18	Mr. Shankar Govinda Zope, 2nd bore.	Raver ..	Thorgawan ..	3″	67′—0″	One mote working for two hours.
19	Grampanchayat, Agricultural School.	,, ..	,, ..	3″	90′—0″	Do. ..
20	Mr. Nana Motiram Patil.	,, ..	Balwadi ..	3″	72′—0″	4″ Pump working for 4 hours.
21	,, ,, 2nd bore..	,, ..	,, ..	3″	60′—0″	4″ Pump working for 6 hours.
22	,, ,, 3rd bore..	,, ..	,, ..	3″		
23	,, D. M. Phadke, 2nd bore.	Bhusawal ..	Rigaon ..	3″	70′—6″	
24	,, Mulchand Lalchand Marwadi.	,, ..	Bodwad ..	3″	27′—0″	
25	,, V. R. Kulkarni, 1st bore.	Jalgaon, East Khandesh.	Nasirabad ..	3″	19′—0″	One mote working for 4 hours.
	,, ,, 2nd bore..	,, ..	,, ..	3″	21′—6″	Do. ..
26	,, Principal, St. Barnaba's School.	Chandwad ..	Manmad ..			

Water after boring in gallons per hour	Departmental charges	Labour charges	Total cost	Cost per foot	Result	Remarks
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
One mote working for whole day.	118 8 0	Information regarding this not yet received from owner			Successful.	
Do. ..	130 0 0	Do.			Do.	
4" Pump working for 6 hours. Water flowing through 4" casing pipe.	100 0 0	40 0 0	140 0 0	1 15 1	Do.	
4" Pump works for eight hours. Water flowing through 4'—15" pipe.	65 0 0	27 0 0	92 0 0	1 8 6	Do.	
						In progress.
	95 12 0	100 0 0	195 12 0	5 8 11	Failure ..	Tool cannot work due to very hard strata.
	41 0 0	72 14 0	113 14 0	4 3 5	Do.	Abundoned by the owner.
	Nil ..	85 0 0	85 0 0	4 7 6		Rejected as the tool cannot work further.
	Nil ..	55 10 0	55 10 0	2 9 5		Do.
						On hand.

APPENDIX D

Annual Report of the Deputy Director of Agriculture, South Central Division, Poona, for the year 1926-27

Staff

Mr. T. F. Main, O.B.E., remained in charge of the division *till* 11th February 1927, when he proceeded on long leave. Since then, I held charge of the division.

During the year, there were several changes in the personnel of the Staff.

A special post of the Personal Assistant was created for five months to help Mr. Main from 3rd July to 30th November who worked as General Secretary, Presidency Agricultural Show. I held the said post. During my absence from the post of the Divisional Superintendent of Agriculture for two periods, Mr. V. V. Gadgil, B.Ag., acted as Divisional Superintendent of Agriculture, Deccan Canals (3rd July to 30th November ; and 11th February to the end of the year).

Mr. D. H. Tagare was on leave and consequently worked as Superintendent, Crops Court, Presidency Agricultural Show, till 30th November 1926. Mr. C. R. Gokhale, acted as Inspector of Agriculture, in his place.

From 24th January 1927, the scheme of the District Local Board, Satara, sanctioned in Government Resolution, Revenue Department, No. 7392-24 dated 1st November 1926 came in force and Mr. G. P. Patil was transferred to the District Local Board, Satara, from Nagar. During the year, one additional post of a Bunding Officer was added to this division in which Mr. M. K. Shirole has been working.

Organisation

The District Staff has been organised and this redistribution has resulted in more intensive and efficient work. However, an increase in personnel is essential to further expansion. In the famine districts like Ahmednagar and Sholapur, there is much scope for work and to do this, additional district officers are essential.

Lines of work

The operations of this division may conveniently be reported under the following sections :—

(I) Research
(II) Propaganda
(III) Agricultural Organisations—
  (A) Taluka Development Associations.
  (B) Non-credit Co-operative Societies.
(IV) Agricultural Services—
  (A) Boring operations.
  (B) Engineering advice and assistance.
  (C) Pig-killing operations.

(D) Field Embankments.
(E) Presidency Agricultural Show.

(V) Agricultural Education.

(VI) Departmental Administration.

Section I

Research

The year under report was a good year for the sugarcane crop.

(1) *Majri Farm.*—This is the fourth year since which new experiments were laid down. The line of experiments followed has been given in the last year's report. The experiment which gave conclusive results within this period have been deleted and new ones have been undertaken.

The results obtained in the year are summarised below.

Quantity of nitrogen required to produce a heavy crop.—Past two years results obtained have shown proportionate increase in yield according to the quantity of nitrogen applied. Seventy-five pounds nitrogen is insufficient and more quantity is essential. But this question of increased nitrogen and consequent increased yield is interdependent on the price of gul and price of manure and hence it is too early to draw any conclusions. The results for two years are tabulated below:—

Serial No.	Treatment	Yield of gul per acre in lbs.		Average of gul in lbs.
		1925-26	1926-27	
1	75 lbs. nitrogen per acre ..	8,030	8,424	8,227
2	150 lbs. nitrogen per acre ..	9,882	10,091	9,986
3	225 lbs. nitrogen per acre ..	9,268	9,942	9,605
4	300 lbs. nirtrogen per acre ..	9,207	10,920	10,063

(2) *Efficient and economic substitute for Farm Yard Manure, e.g., Sann Green Manuring.*—An experiment to see whether the Sann Green Manure alone is beneficial as an economic and efficient dose to sugarcane before planting in comparison with Sann Green Manure plus Farm Yard Manure or Cake manuring. The total quantity of 200 lbs. of nitrogen per acre is equal to old dose of Farm Yard Manure before planting. The three years' results show that additional dose in the form of Farm Yard Manure and Cake is not necessary and has not proportionately increased the yield of gul. It seems the dose of Sann Green Manuring as a source of organic matter supply which is

most important to Canal lands is sufficiently economic and efficient. The results are tabulated below :—

Treatment	Weight of gul per acre in lbs.			Average in lbs.
	1924-25	1925-26	1926-27	
Sann plus Farm Yard Manure=200 lbs. nitrogen	9,854	9,682	9,696	9,744
Sann plus Safflower Cake=200 lbs. nitrogen	9,854	9,464	9,342	9,553
Sann alone=80 lbs. to 100 lbs. nitrogen	10,682	9,425	9,713	9,940

(3) *Suitable Crops for rotation with sugarcane.*—Several monetary crops have been introduced in this experiment as three and four-year rotation to sugarcane. The results after a complete cycle will be reported.

(4) *Quantity of irrigation water and interval between two consecutive waterings.*—This will require some years more to corroborate the points of variation.

(5) *Selection of profitable varieties.*—Preliminary study of these varieties and results obtained have been published in a Bulletin No. 125 of 1925 of the Bombay Presidency. These varieties in addition to the new ones were under trial during the year and the varieties D.—109 and H.M.—544 have shown higher yielding capacity.

(6) *Botanical study in the field and chemical control of Gurhal operation.*—The work is being continued.

(7) *Study of tillering and root system.*—The results obtained this year in thinning cane have corroborated those of past two years and thinning at earthing up is more advantageous than the rest. This experiment will be continued for a year more and will then be discontinued. The yields of three years are tabulated below :—

Serial No.	Treatment	Yields of gul per acre in lbs.			Average of 3 years in lbs.
		1924-25	1925-26	1926-27	
1	Tillers removed at four months .	12,456	11,014	9,154	10,874
2	Tillers removed at earthing up..	11,365	12,330	9,537	11,077
3	Check with no tiller cut ..	7,451	8,613	9,333	8,465

(8) *Suitable crops for non-block land in canal area.*—There is a greater area outside block area under canals. In order to investigate best money bringing crops for this area, an experiment has been laid down in a three-year rotation series in which nine crops have been included. The results will be summarised after a full cycle is completed.

(9) *Sugarcane-class.*—As in the past years, this class was arranged and 15 students attended the class. Great difficulty was experienced for accommodating students for want of accommodation. The students however went trained.

(10) *Visit of the Royal Commission on Agriculture.*—The Commission paid a visit to the Farm on 26th October 1926 during their stay at Poona. The Commission was satisfied and the remarks of Marquess of Linlithgow, President of the Royal Commission, are as under :—

" The Royal Commission on Agriculture enjoyed a most instructive tour of the Farm and I and my colleagues retain a very pleasant re-collection of our visit to the Station at which so much valuable work is being carried out."

(11) *Profit and loss.*—The following statement will reveal the cost of cultivation, value of produce, profits and yield per acre for three years as per standard method of Manjri Farm (cost per unit of labour equal to 11 annas) :—

Year	Cost of cultivation	Value of produce	Profit per acre	Average yield of gul per acre	Rate of gul (in lbs.)
	Rs. a. p.	Rs. a. p.	Rs. a. p.		
1924-25 ..	660 10 6	1,186 6 0	457 11 6	36 Pallas	8
1925-26 ..	635 9 0	926 6 0	290 13 0	37 ,,	10
1926-27 ..	623 13 0	903 13 0	279 15 7	39·8 ,,	11

(12) *Baramati Farm.*—The cycle of experiments laid down has not yet been completed and hence interesting results are not available for summarising.

(13) *Kopargaon Farm.*—The average yield of gul obtained on this Farm was very good, *viz.*, 11,204 lbs. per acre of plant-cane and 10,634 lbs. of Ratoon-cane. A series of experiments proved on Manjri Farm have been conducted with modification on this Farm for Godavari Canal sugarcane growers for the sake of confirmation and demonstration. As the cycle has not been completed all the results are not available. In the varietal trial D—109 and H.M.—544 have been brought on the record of yielder yielding 13,840 lbs. gul and 10,971 lbs. respectively. During the last seven years several varieties were under trial and interesting results have been secured which will be printed shortly in a leaflet form.

In the nitrogeneous series, trying different quantities from 200 to 350 lbs. nitrogen to get the maximum yield, 200 lbs. nitrogen dose has given the highest yield this year. The experiment will require some years continuing to arrive at conclusive results.

(14) *Mohol Farm.*—A plot of 55 acres and 20 gunthas has been on lease for nine years situated in Sholapur District. The chief crops grown are cotton and rabi jowar under improved methods as are

required to be adopted in famine areas. An experiment in selection of seed by grading with sieves was conducted and the results have been very interesting. These are tabulated below :—

Serial No.	Treatment	No. of plants per acre at harvest	Yield per acre		Remarks
			Grain	Fodder	
			lbs.	lbs.	
1	Seed graded with sieves ..	24,105	928	1,352	
2	Ungraded seed	20,450	626	926	

Note 1.—In each, quantity of seed sown per acre was the same. The following number of seeds in one tola weight of different types will reveal the proportionate weights.

	(Grains in tola)
(1) Graded seed	351
(2) Ordinary seed	395
(3) Rejected after grading	582

Note 2.—The seed obtained was from heads selected for seed in both the cases.

The above results will show the increased yield from grading. This has been appreciated by several cultivators in the Desh and there is a demand for sieves.

Section II

Propaganda

The principle items of programme of the District Staff are as under :—

(1) *The Popularization of the Copper Sulphate treatment of Jowar against Smut.*—With the help of Revenue and Irrigation Officers, intensive propaganda was done for distributing copper sulphate packets by means of demonstrations, lectures, etc., and the number distributed was as under for each district :—

	Name of district	Number of packets distributed in 1926-27
(1)	Poona	2,968
(2)	Sholapur	2,510
(3)	Ahmednagar	4,681
(4)	Satara	1,130
(5)	Canal area	3,915
	Total ..	15,204

(2) *Introduction of New-crops and Varieties—(a) Introduction of sugarcane varieties in the Canal Tract.*—The Sugarcane varieties H. M. 544, D. 109 and Red Sports were given a trial in cultivators' fields on all the three canals. The varieties H. M. 544 and D. 109 have again recorded high yields of Gul. H. M. 544 and D. 109 on Nira Canal have yielded 13,644 and 15,093 lbs. of Gul per acre. The cultivators have

appreciated the variety H. M. 544 for its special character. Arrangements have been made to distribute the sets at concession rates, *i.e.*, at ½ the price; and the total distribution and the area covered by this variety as well as D. 109 on the three canals are as under during the year. It is expected that next year the area will be increased :—

Name of canal	Name of variety	Number of sets distributed	Area planted	Remarks
			A. g.	
(1) Nira Left Bank Canal.	H. M. 544	234,000	45 2	9 Villages.
(2) Pravara Canals ..	D. 109	19,000	2 20	1 Village.
	H.M. 544	31,000	3 20	
(3) Godavari Canals ..	H.M. 544	66,200	8 20	8 Villages.

(*b*) *Introduction of N. R. Cotton in Canal Area and Nagar and Sholapur Districts—(i) Canal Area.*—Early sowing of N. R. Cotton in May on the Nira Canal was advised and several cultivators had sown their area as water was made available by Irrigation Department. The cultivators realised good yields and the crop has been considered as one of the monetary crops. The yields obtained per acre maximum and average on the three canals have been tabulated below :—

Name of canal	Yield of seed cotton in pounds per acre	
	Maximum	Average
(1) Nira Left Bank Canal	1,905	1,168
(2) Pravara Canal	1,065	627
(3) Godavari Canal	1,075	1,012

This year the water was made available in May on the Godavari and Pravara Canals too, and a regular propaganda was carried on for advising cultivators to sow cotton in May by holding meetings at 12 places. Consequently, more area has been sown and the approximate area on each canal in 1927-28 is as under :—

Name of canal	Approximate area sown under cotton in 1927
(1) Nira Left Bank Canal	6,135
(2) Pravara Canal	300
(3) Godavari Canal	1,100

The following quantities of fresh seed of N. R. from Khandesh were brought and distributed to cultivators :—

	lbs.
(1) Nira Left Bank Canal	15,000
(2) Pravara Canal	2,000
(3) Godavari Canal	4,000

Besides, the Taluka Development Association, Banks and private merchants imported the seed of N. R. and distributed.

Jalgaon Farm N. R. Seed 1,500 lbs. was brought and given to two cultivators. It will be ginned and distributed next year.

(*ii*) *Nagar and Sholapur Districts.*—In Shevgaon Taluka of Nagar District, in addition to the seed of N. R. that was locally reserved from the crop grown from last years Khandesh Seed, fresh seed 3,625 lbs. of N. R. was imported and distributed. The cultivators have realised the importance of N. R. seed over local.

In Sholapur District, N. R. Cotton is grown under irrigation and 1,285 lbs. N. R. Seed was distributed from the quantity grown on Mohol Farm.

(*c*) *Introduction of fresh seed of New Big Japan and Pondicherry in Satara District and Spanish Peanut in Nagar and on Canal Area.*—The following statement shows the distribution of different varieties of groundnut distributed during the year :—

Name of variety	Quantitiy	Name of District
	lbs.	
(1) New Big Japan	2,000	Canal Area.
Do.	1,900	Sholapur District.
(2) Spanish Peanut	3,000	Canal Area.
Do.	630	Ahmednagar District.

On the Canals, Spanish Peanut has been found to yield 1,950 lbs. dry-nuts per acre and it is very likely that it will spread for the two main reasons, *viz.*, (1) short period of growth and (2) less water charges as against New Big Japan. In Newasa and Shevgaon talukas of Nagar District and Khed and Junnar of Poona District, the Spanish Peanut is showing signs of spread as a dry crop.

(*d*) *Introduction and dissemination of Akola Bajri.*—In all the Districts and even on Canals the importance of Akola Bajri has been well realised owing to high yield and the keen demand for this variety of seed. Arrangements were made to secure the best seed at Akola from the growers and 7,374 lbs. Akola Bajri seed was distributed in the Division.

(*e*) *Introduction of Pusa 4, Potato and Ginger Crops in Canal Area.*—

(*i*) *Pusa 4 Wheat.*—This variety is very much liked by the Canal cultivators owing to its Rust resistance character. During

the year, 500 acres were under this crop and there is hope of increase in the near future.

(*ii*) *Potato.*—On the Canal Area Potatoes were given a trial as Kharif and Rabi crop. As Rabi crop the yield has come to 6,200 lbs. per acre. There are hopes of this being introduced as a Rabi crop.

(*iii*) *Ginger.*—Some trials were made and the crop has yielded 1,280 lbs. per acre.

(3) *Introduction of Improved Methods in Sugarcane growing (canal area), Java method and Cotton Cultivation—*

(*i*) *Sugarcane growing* :—

(*a*) *Wide method of planting cane.*—On the Canal area several demonstration plots in cultivators' fields were laid down to show the advantages of wide method of planting (modified Manjri Method, *i.e.*, 4' wide). This has been now appealing to the Sugarcane growers and nearly 7,000 acres on these canals were under this method.

(*b*) *Reduction of sets.*—Sugarcane growers usually plant 15,000 to 18,000 sets, but 8,000 sets have given good results, which were demonstrated in several cultivators' fields. It is estimated that about 7,000 acres have been planted with 8,000 to 10,000 sets per acre. In the near future, it is expected that these two systems will be adopted by the sugarcane growers on all the three canals.

(*ii*) *Java Method of Planting.*—A complete description has been given on pages 55 and 56 of the Annual Report of the Department for the year 1923-1924. Several plots since then were laid down and the advantages of this method shown with regard to the yield obtained. The method is now appealing to cultivators on the Canal and the area of Sugarcane under this method is as under :—

Name of canal	Area plant with Java method
	Acres
(1) Godavari Canal	32
(2) Pravara Canal	6
(3) Nira Left Bank Canal	4
	42

Irrigation Department has decided to give concession and hence the progress.

(*iii*) *Cotton cultivation.*—Cotton growing on Canal is a new problem and hence several improved methods such as sowing on ridges, sowing with drill and inter-culturing were demonstrated to cultivators. The sole aim of introduction of improved methods is to get the highest yields to Canal cultivators.

(4) *Spraying and Fumigation operations.*—The potato growers of Khed Taluka have realised advantages of these two remedies as a prevention against insect and disease attack. In the year under report the attack of Tambera was not severe. Thirty-four acres and 20 gunthas of

Potato crop was sprayed against Tambera and 11,480 lbs. of Potatoes were fumigated for borer.

(5) *Grass-Hopper Campaign.*—In the Satara District a campaign of bagging Grass-Hoppers was conducted from August to December at 32 villages.

(6) *Horticultural operations.*—On the Canal area, the area under fruit trees is increasing. Specially area under Figs, Chikoos is increasing. On Godavari Canal, area under Grafted Mangoes is increasing.

(7) *Land Development Schemes.*—The Agricultural staff attended to the following number of Land Development schemes during the year :—

(1) On the Canal Area	7	Schemes
(2) In Desh	30	,,

(8) *Implement Depots.*—Several of the Depots have been transferred to the Taluka Development Associations. The total hire recovered in this Division amounted to Rs. 740-3-0. The work of hiring ploughs, etc., has been taken by private gentlemen and Implement Societies.

(9) *Shows and Demonstrations.*—As regards methods adopted for conducting propaganda, they are summarised as follows :—

(1) Organised Shows ; (2) Implement Demonstrations ; (3) Manurial Demonstrations ; (4) Trials of new crops, (5) Steeping, spraying, etc., and (6) Organisation of Depots, Implement Societies, Seeds and Manure Societies.

(10) *Departmental and Association Fieldmen and Kamgars' Training Class* :—A class for a period of 10 days was arranged at Loni Agricultural School for the propaganda workers of the Fieldmen and Kamgars type belonging to Department and Associations, etc., in this division. 61 candidates as detailed in the margin* attended the Class. A special course of subjects on Agriculture, Co-operation, and Irrigation Rules and Agricultural Propaganda was outlined and it was taught for ten days. The candidates were examined by means of two papers and 50 of them passed the examination. The course was found to be educative and the candidates returned to their places of work, full of information.

*(1) Departmental Fieldmen and Kamgars ..	11
(2) Taluka Development Association Kamgars.	13
(3) Irrigators' Societies Secretaries ..	31
(4) Private	6
Total ..	61

(11) A summary of work done in each District and Canal Area is given below :—

(a) *Poona District* :—Several Demonstration plots showing advantages of new crops such as Kolamba Strains, Akola Bajri, Spanish Peanut and of Manures, such as Sodium Nitrate to Potatoes, Onions and Garlic were arranged in the District. Eight Magic

Lantern Lectures, 5 Demonstrations of Crops, Manures, etc., and lectures at 9 Jamabandi meetings were organised. Besides, several steeping demonstrations were held.

(b) *Ahmednagar District*:—During the year steeping demonstrations at 26 places, lectures at 2 Jamabandi Meetings at Akola and Sangamner were organised. Besides this, at several places Chaffcutter and Spraying demonstrations were arranged. Demonstration plots showing advantages of N. R. Cotton over Local Cotton, Akola Bajri and Spanish Peanut, Kolamba Strains, were arranged at several places. N. R. cotton, on an average, has given 477 lbs. of seed Cotton as against 392 lbs. Local Cotton. Akola Bajri has yielded 602 against 488 lbs. local seed. Spanish Peanut has given on an average 720 lbs. yield per acre.

(c) *Satara District*:—During the year, there were two Agricultural and Cattle Shows the former at Karad and the latter at Yellur. 22 Steeping Demonstrations, 46 Chaffcutter Demonstrations, 2 Stone-Roller Threshing Demonstrations, 4 Poona Furnace and 1 Turmeric Polishing Demonstration, were arranged. Demonstration Plots of Kolamba Strains, Akola Bajri, etc., were arranged. Turmeric treated with Ammonium Sulphate has yielded 22,540 lbs. (green weight) against 18,100 lbs. untreated.

(d) *Sholapur District*:—Nine demonstrations showing advantages of crops, New seeds and Implements were held at Mohol, Barsi, Mahud, Upla, Ghari, Ropla, Mimbori, Pophalaj and Rajuri. The advantages of growing Jowar from graded seed and wide method are being popularised in several villages. Land development schemes are being advised to prevent erosion of soil and consequent low yield of crop. The following results obtained on Mohol Farm of Jowar crop on washed piece of land and unwashed piece of land are demonstrated. The yield obtained in washed piece of land against unwashed piece of land came to 197 lbs. grain and 475 lbs. Kirbi as against 967 lbs. grain and 1095 lbs. Kirbi.

(e) *Canal Area*:— (This includes Nira Left Bank Canal, Pravara and Godavari): During the year, 12 special meetings of cultivators to explain importance of early sowing of Cotton and Tobacco growing, 70 steeping demonstrations and 21 Crop demonstrations to show the advantage and importance of H.M. 544 Sugarcane varieties, N.R. Cotton, Polishing of Turmeric Crop, Grape cultivation, manufacture of Sugar, were conducted. These were largely attended to by cultivators and irrigators. In the spacing experiment of Sugarcane 4 ft. method has given high yield over local method. The average yield of several plots stand as 10,132 lbs. against 9,520 lbs. of Gul per acre. Similarly in the experiment of reduction of sets from 12,000 to 8,000 the yield obtained is 8,650 lbs. to 8,898 lbs. Gul per acre. In the Java method of planting the maximum yield obtained is 7,920 lbs. of Gul per acre and average of several plots is 6,998 lbs. Akola Bajri trials have given 942 lbs. *versus* 775 lbs. local, *i.e.*, nearly 21 per cent., more yield.

Section III

"A"

Agricultural organisation

Taluka Development Associations.—In the year under report, till February 1927, the total number of registered Taluka Development Associations in this Division was 7. After the scheme of the District Local Board, Satara, sanctioned in Government Resolution, Revenue Department, No. 7392-24 dated 1st November 1926, 5 more Associations were registered and the total number as it stands on 1st April 1927 is now 12. They stand as under per District :—

(1)	Poona	..	(1) Khed.
			(2) Junnar.
			(3) Nira Left Bank Canal Agricultural Development Association.
(2)	Satara	..	(1) Satara.
			(2) Walva.
			(3) Karad.
			(4) Khatav.
			(5) Wai.
			(6) Koregaon.
			(7) Tasgaon.
(3)	Sholapur	..	(1) Madha.
			(2) Karmala.

The chief works done by these Associations are summarised below :—

(*a*) Distributed Copper Sulphate Packets and demonstrated Steeping of Jowar ; Nira Left Bank Canal Association distributed 2,000 packets.

(*b*) Spraying of Crops.—Khed Association sprayed 34 acres and 20 gunthas of Potatoes against Tambera disease. Walwa Association sprayed Chilli crops against Khokada.

(*c*) Distributed N. R. Cotton Seed, Ground-nuts, *viz.*, Big Japan, Pondicherry, Spanish Peanut Seeds and Akola Bajri and vegetable seeds in large quantities.

(*d*) Demonstrations, Shows and Conferences were arranged. Walva Association organised a Cattle-Show and a Taluka Co-operative Conference ; Nira Left Bank Canal Association organised fruit cultivation Demonstrations at 3 places ; Madha Association supervised 36 Societies and made an economic enquiry in Agriculture and co-operation at 89 villages ; Karmala Association also supervised 21 Societies and made economic enquiry at 10 villages.

(*e*) A sub-branch for supply of Plows on hire was organized by Nira Left Bank Canal Agricultural Development Association at Gotandi where implements worth Rs. 900 have been purchased and kept on hire.

(*f*) All Associations rendered every help to Presidency Agricultural Show by sending Agricultural exhibits from their respective Talukas and the batches of cultivators.

Out of the 12 Associations, 7 Associations worked and the rest could not commence work as they were registered late in March 1927.

Section III

"B"

Non-Credit Societies

On the 1st April 1926, there were 41 Societies. No Society was cancelled. During the year 6 Taluka Development Associations and 2 Sale Unions were registered and the total number of non-credit Societies stood at 49.

Amongst Non-credit Societies, Implement Societies of Sheogaon, Pathardi and Jamkhed, registered last year worked well and realised Rs. 1,318, Rs. 1,205 and Rs. 474 respectively as hire of Plows, etc.

Haveli Taluka Gul Sale Society and Yellur Guaranteeing Union did useful work. The total produce handled by each, amounted to Rs. 2,91,834 and Rs. 1,09,597 respectively.

In the Manure Societies, Hadapsar Society has put in good work.

Section IV

Agricultural Service

The service under this head can be mentioned in the following form :—

Section IV-A

Boring Operations :—In the year under report 6 Boring Machines were working in Poona, Sholapur and Ahmednagar Districts. In addition to these 6, F.3 Calyx Machine worked round about Poona. Three Machines were under conversion into Power Machines and hence out of 6 only 3 worked for full year and the remaining for part of the year. The total number of bores undertaken were 48 and 24 of these were successful. The total footage was feet 3,414-6 against feet 2,878-3 of the previous year. The details of the working of these Machines is tabulated below :—

Statement showing the details of

Serial No.	Name of well master	Name of Taluka	Name of Village	Diameter of Boring	Depth of Boring		Water after Boring
	Poona District			Inches	Ft.	in.	
1	D. H. Dunakhe ..	Indapur ..	Bawda ..	4	50	0	Gallons 200
2	Do. ..	Do. ..	Do. ..	4	77	0	No water.
3	Do. ..	Do. ..	Do. ..	4	83	0	Do.
4	T. M. Jamadade ..	Purandar ..	Khalad ..	3	225	0	Gallons 200
5	D. R. Pathare ..	Haveli ..	Charoli ..	5½	70	0	Do.
6	Do. ..	Do. ..	Do. ..	5½	126	0	Do.
7	G. N. Patil ..	Indapur ..	Bawda ..	4	50	0	Do.
8	Do. ..	..	Do. ..	4	53	0	Do.
9	Manmath Vithoba ..	Do. ..	Do. ..	4	50	0	Do.
10	Vittal Kisandas ..	Do. ..	Do. ..	4	52	0	Do.
11	Shiriram Tempal ..	Khed ..	Alandi ..	4	129	0	No water.
12	K. H. Talyarkhan ..	Haveli ..	Kharadi ..	3	75	0	Do.
13	G. N. Ghadge ..	Indapur ..	Bhodani ..	4	35	0	Gallons 200
14	B. R. Hange ..	Do. ..	Do. ..	4	35	0	Do.
15	Devidas Rupaji ..	Khed ..	Alandi ..	4	180	0	No water.
16	Abdul Husen ..	Haveli ..	Chinchwad ..	5½	110	0	Gallons 200
17	Do. ..	Do. ..	Bopdi ..	5½	248	0	No water.
18	V. R. Phansalkar ..	Do. ..	Chinchwad ..	5½	152	0	Gallons 200
19	G. D. Hange ..	Indapur ..	Bhodani ..	4	52	0	No water.
20	Ramchand Malukchand .	Bhimthadi ..	(Raai) Baramati.	4	70	0	Do.
21	Do. do. ..	Do. ..	Do. ..	4	65	0	Do.
22	Do. do. ..	Do. ..	Do. ..	4	50	0	Do.
23	Do. do. ..	Do. ..	Do. ..				
24	Krishna Khandy Patil..	Haveli ..	Manjri ..	3	107	6	No water.
25	Khubchand Kankuchand.	Do. ..	Chakan ..	4	52	0	Gallons 200
26	D. R. Marvadi ..	Do. ..	Do. ..	4	62	0	Do.
27	Maliba Hariba ..	Do. ..	Do. ..	4	52	0	No water.
28	Do. ..	Do. ..	Do. ..	4	50	0	Do.
29	Shankardas Tularam Pardesi.	Do. ..	Chinchwad ..				
	Sholapur District						
30	Manikchand Amichand .	Sholapur ..	Sholapur ..	3	26	0	Gallons 200
31	Do. ..	Do. ..	Do. ..	3	27	6	Do.

Bores taken during the year 1926-27

Departmental charges	Labour charges	Cost of fuel, Lubricating oil, coal, etc.	Total cost of Boring	Cost per Foot	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
51 4 0	45 0 0	70 8 0	166 12 0	3 5 4	Completed this year previous work done 37 feet.
0 10 0	135 0 0	155 0 0	290 10 0	3 12 3	
....	125 8 0	149 3 0	274 11 0	3 4 11	
318 8 0	115 8 0	222 4 0	656 4 0	2 14 8	
103 11 6	18 0 0	55 11 0	177 6 6	2 8 7	
293 7 0	33 0 0	89 14 0	416 5 0	3 4 10	
50 0 0	34 0 0	65 7 0	149 7 0	2 15 10	
54 8 0	24 0 0	54 9 0	133 1 0	2 8 2	
50 0 0	30 0 0	40 0 0	120 0 0	2 6 5	
53 0 0	45 11 0	84 14 0	183 9 0	3 8 6	
2 0 0	138 11 0	194 14 6	335 9 6	2 9 7	
24 0 0	154 0 0	283 0 0	461 0 0	6 2 4	The rock was very hard and labour dear. Hence cost per foot is very great.
35 0 0	19 0 0	38 7 0	92 7 0	2 10 3	
35 0 0	24 0 0	33 9 0	92 9 0	2 10 4	
4 0 0	75 4 0	154 14 0	234 2 0	1 4 10	
140 0 0	60 4 0	150 12 0	351 0 0	3 3 1	
....	80 4 0	306 8 6	386 12 6	1 8 11	
218 5 9	20 12 0	20 12 0	259 13 9	1 11 4	
....	35 3 6	52 12 3	87 15 9	1 11 1	
....	39 8 0	125 2 0	164 10 0	2 5 8	
....	45 0 0	76 4 0	121 4 0	1 13 10	
....	36 0 0	74 2 0	110 2 0	2 3 3	In hand.
53 0 0	29 8 0	33 0 0	115 8 0	2 3 6	
70 0 0	40 0 0	45 4 0	155 4 0	2 8 2	
....	29 0 0	39 6 0	68 6 0	1 5 0	
....	16 0 0	20 0 0	36 0 0	0 11 6	In hand.
36 10 0	50 0 0	69 4 3	155 14 3	5 15 11	The strata is hard and hence cost per foot was great.
38 10 6	35 5 0	69 5 3	143 4 9	5 3 4	Do.

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Serial No.	Name of well master	Name of Taluka	Name of Village	Diameter of Boring	Depth of Boring		Water after Boring
	Sholapur District—contd.			Inches.	Ft.	in.	
32	Y. R. Kulkarni ..	Sholapur ..	Boramani ..	3	85	6	No water.
33	R. S. Javlekar ..	Do. ..	Sholapur ..	3	36	6	Gallons 200
34	T. G. Bhosale ..	Do. ..	Boramani ..	3	55	0	Do.
	Ahmednagar District						
35	T. B. Patil	Nagar ..	Jour ..	3	78	0	Gallons 200
36	Do. ..	Do. ..	Do. ..	3	59	0	No water.
37	Captan Shaikh Imam ..	Do. ..	Hamidpur ..	3	82	0	Gallons 200
38	Gayaji Patil ..	Rahuri ..	Khadamba ..	3	141	0	No water.
39	T. M. Kachole ..	Do. ..	Do. ..	3	20	6	Gallons 200
40	V. P. Kshirsagar ..	Do. ..	Do. ..	3	20	0	Do. ..
41	Gajanan Harichandra ..	Do. ..	Do. ..	3	51	0	No water.
42	B. D. Kulkarni ..	Do. ..	Do. ..	3	51	0	Do. ..
43	Do. ..	Do. ..	Do. ..	3	52	0	Gallons 200
44	T. D. Mahane ..	Do. ..	Do. ..	3	53	0	No water.
45	D. T. Sase	Nagar ..	Jour ..	3	100	0	Do. ..
46	M. D. Kolhapure ..	Rahuri ..	Khadamba ..				
47	Rev. Steadman Aldis ..	Kopargaon ..	Puntamba ..	4	116	0	Gallons 200
48	Do. ..	Do. ..	Do. ..				

Departmental charges	Labour charges	Cost of fuel, Lubricating oil, coal, etc.	Total cost of Boring	Cost per Foot	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
....	65 12 0	105 14 0	171 10 0	2 0 2	
90 10 3	128 13 0	154 4 0	373 11 3	10 3 10	The cost of transport cost much. Labour was very dear. The rock was very hard. Hence the cost per foot was very great.
57 8 0	70 0 0	112 4 0	239 12 0	4 5 9	
96 8 0	34 0 0	88 0 0	218 8 0	2 12 11	
4 8 0	28 4 0	64 9 0	97 5 0	1 10 5	
114 6 0	82 8 0	196 14 0	393 12 0	4 12 10	
4 8 0	90 0 0	220 8 0	315 0 0	2 3 10	
24 8 0	17 8 0	49 0 0	91 0 0	4 7 0	
24 0 0	12 0 0	24 7 0	60 7 0	3 0 4	
....	41 0 0	87 4 0	128 4 0	2 8 3	
....	60 0 0	95 15 0	155 15 0	5 0 11	
53 0 0	45 0 0	70 15 0	168 15 0	3 4 0	
3 3 0	30 0 0	62 8 0	95 11 0	1 12 10	
4 4 0	25 0 0	44 8 0	73 12 0	0 11 10	
					In hand.
149 0 0	118 8 0	100 10 0	368 2 0	3 2 9	
					In hand.

Section IV-B

Engineering Advice and Assistance.—The Mechanical Assistant looked after the Power Plants at Manjri, Loni and Kopargaon and at the Presidency Agricultural Show. Besides this, during the year under report his services were fully utilised as under, both departmentally and in the interest of cultivators :—

(*a*) *Extension for the Boring Machines.*—A new design of extension to the present Boring Machine was prepared and all the Machines in this Division are fitted with these. This facilitates work on *big wells* of larger dimensions.

(*b*) *Erection of New Plants.*—Three Oil-Engines and Power Crushers were erected at Bawada and Loni Kalbhor belonging to cultivators.

(*c*) *Mechanical Advice.*—He visited four Pumping Plants and also 25 Power Crushers on the Canal Area and inspected the machinery and gave advice and instructions. Similarly help was rendered for erection of one Chatoonooga No. 92 and Krupp Power Crusher on Pravara and Godavari Canals respectively. The actual working of the Departmental Power Crushing Plant No. 92 was demonstrated in the Presidency Agricultural Show along with No. 44 Plant. Ruston Proctor Mill was given on hire. The hire received from this Mill amounted to Rs. 325. There has been an increase in the number of Power Crushers and the number has risen to 42 Plants.

(*d*) *Pumping Plants.*—He visited five wells for Pumping and prepared site-plans and estimates and supplied to cultivators ; of these, two plants were erected during the year under report. He also selected two sites on Rivers Koyna and Nira for installing Pumping Plants ; out of these, erection of a Pumping Plant on the Nira (near Nimbut village) has already been commenced. One Balsar Rahat on River Indrayani near Kamshet was also erected.

Section IV-C

Pig-killing Campaigns.—The work was conducted on the lines mentioned in the last year's report which are as under :—

(1) Organisation of Hunting parties consisting of Vaidus and Dogs and doing the work during the day and also by moon-light.

(2) Use of Pig-proof Wire Fence.

The method of work adopted was the same like that of last year. Vaidus and Dogs were engaged on daily wages and the cost paid, both by the Department and by the cultivators, in the proportion of half to half. The work done as per this method is tabulated below. It will be seen from the statement that the cost of kill has been brought to the minimum when compared with the last year and the efficiency of work improved which may be seen from the Pigs killed :—

Serial No.	Name of Place	Month during which work was organised and done	Pigs killed	Total cost of Beaters, dogs, ammunition, etc.	Cost per kill	Remarks
				Rs. a. p.	Rs. a. p.	
1	Taluka Shevgaon ..	December 1926.	53	308 11 0	5 13 2	Poona party (Rs. 104 is for transport on party from Poona to Mungi and back.)
2	Taluka Shevgaon ..	January 1927.	21	112 0 0	5 5 4	Supplementary work in the above tract by two Gunners from Poona party and village beaters services lent to the people.
3	Taluka Koregaon ..	February 1927.	35 and 1 Panther.	245 4 0	6 13 0	Reserved Forest work. Poona party aided by villagers in beating.
4	Godavari Canals (Right and Left Bank).	Part of March and April 1927.	76	330 0 0	4 5 6	Local Vaidu beaters and dogs and Poona Gunmen.
5	Pravara Left Bank Canal (Distributary 3 to D7 and 32nd and 33rd *plus* 23rd water courses.)	Part of March and May.	23	104 12 8	4 8 2	Local Vaidu beaters and dog and Poona Gunmen. Tract finished and nearly free of pigs (4th trip) Ground-nut being grown; and replacing part of Cane area.
6	D6 and D7 Pravara Left Bank Canal.	10th May 1926 to 31st May 1927.	22	22 0 0	1 0 0	Cost of ammunition only; work of Gun-Club. Farmers trained in use of Gun and working by night in Ground-nut and Maize.

During the year under report, the Officer-in-charge Pig-killing Campaigns made special efforts to organise Gun-clubs at the marginally noted* three places with the object that the cultivators would be interested in the work and consequently the cost would come down. Fresh lisenses for 10 owners (reliable cultivators) and for 10 retainers in the Gun-club on the Pravara Left Bank Canal were obtained and given. This Club did very useful work which is given under No. 6 in the above table. The cost per kill came to Re. 1 only. The Club at Palshi-Kolawadi is still under organisation whose work will be reported later on.

*(1) Khadakavasala tract of the Mutha Valley.
(2) Khandala Tract; Distributory Nos. 3 to 7 on Pravara Left Bank Canal.
(3) Palshi-Kolwadi Group in Koregaon Taluka (Satara District).

Use of Pig-proof Wire Fence.—As reported in last year, 22 acre area has been fenced of a Cultivator at Nanded. The cultivator had specially maintained the record of observation and his report is that he is satisfied with the fence as there were no ravages and that, he could secure per Acre 3 Pallas Gul more which is equal to Rs. 60 when compared with non-fenced area and saved the cost of watching.

In the Presidency Agricultural Show the above methods were demonstrated and as a sequence, a keen demand for the services of Pig-killing Officer for undertaking campaigns and inquiries for " Pig-Proof Fence " have arisen.

A leaflet on " Pig-killing to decrease damage to Crops " has been prepared and will be published soon.

Section IV-D

Field Embankment.—This year, the post of a Bunding Officer has been sanctioned for this Division. The said Bunding Officer was under training from 7th December 1926 till the end of March 1927, after which period he has been working in this Division. The total number of schemes received for advice and execution was 344 ; out of these, four schemes have been actually surveyed and 16 were disposed of by giving advice after visiting the sites.

Section IV-E

Presidency Agricultural Show.—During the year under report, the attention of the whole staff was devoted towards the Presidency Agricultural Show work for four months. In order to popularize the Show, meetings were held at several places in consultation with the Revenue authorities. Full information regarding exhibits was supplied. All the District staff was busy in collecting exhibits for the Show. Rao Saheb Vagholkar worked on the Lecture Sub-Committee of the Show and helped the General Secretary in miscellaneous other works ; Mr. Gadgil was in charge of the Organization Court.

During the Show period (20th to 31st October 1926) practically the whole of the Staff in this Division worked whole-heartedly as demonstrators at the several Crops Court ; besides, two men were given to help the Rural Education Section and three were given for the Marketing Section. From the four Districts, *viz.*, Poona, Satara, Ahmednagar and Sholapur including Native States, 850 exhibits were placed at the Field Produce Section in the Show ; and the following is a list of prizes awarded :—

Serial No.	Crop group	1st prize		2nd prize		3rd prize	
		No.	Bronze Medals	No.	Value	No.	Value
					Rs.		Rs.
1	Rice	1	1	1	4	..	..
2	Jowar	1	1	1	6	3	12
3	Bajri	1	1	1	7	4	16
4	Wheat	1	1	1	6	3	12
5	Maize	..	..	1	4	..	..
6	Millets	1	1	2	8	..	..
7	Pulses	1	1	3	18	7	28
8	Groundnuts	3	3	4	22	5	18
9	Safflower	1	1	1	4	2	6

Serial No.	Crop group	1st prize		2nd prize		3rd prize	
		No.	Bronze Medals	No.	Value	No.	Value
					Rs.		Rs.
10	Seasamum	1	1	1	3	..	..
11	Linseed	1	1	1	3	..	..
12	Castor	1	1	1	3	..	..
13	Cottons	1	1	1	6	4	16
14	Other Fibres	..	..	..	..	3	9
15	Tobacco	1	1	..	..	..	..
16	Sugarcane	1	1	2	15	4	20
17	Gul	1	1	1	7½	4	20
18	Market-Garden	6	6	4	20	7	21
	Total ..	23	23	26	136½	46	178

Besides the above, two Gold and one Silver medal were awarded as "Group prizes."

Section V

Agricultural Education.—The Marathi Agricultural School at Loni Kalbhor was run on the same lines. Thirty boys were selected for the first Year's course out of a number of 105 applicants. Only 26 remained till the end of the term. The following statement shows the results of the examinations :—

Year	No. of boys in Class	No. of boys appeared for Examination	No. of boys passing the Examination
First year	26	26	24
Second year	22	17	14

The expenses of the year amounted to Rs. 16,270-9-7 and the receipts came to Rs. 1,610-6-9. During the year seven teachers were trained for Agricultural Bias Classes from Poona, Satara, Sholapur, Ahmednagar, Nasik, East Khandesh and Belgaum Districts and they passed the annual examination.

In this Division there are 11 Agricultural Bias Classes and every help was rendered to the School for arranging the cropping Scheme, examining the boys, etc., by the District Staff.

The Loni Agricultural School was visited by the Royal Commission on Agriculture in October 1926.

Section VI

Co-ordination of Revenue and Agricultural Officers.—In every District, at the time of Jamabandi Meetings arranged by the Collectors or the Deputy Collectors, departmental Staff arranged a small show

and gave a talk on important Agricultural improvements which would be adopted by the cultivators of the place. Amongst Assistant Collectors and District Deputy Collectors, Mr. Shaik, District Deputy Collector, E. D., Poona, took the greatest part in the organisation of meetings and arranging lectures in his Division.

Besides this, the Mamledar of each Taluka co-operated in organizing and attending the demonstrations held in their respective Talukas.

Divisional Board of Agriculture.—The Deccan Divisional Board of Agriculture met twice, and from 1st November as per paragraph 1 (*a*) of G. R., R. D., No. 4062/24, dated the 17th May 1926, the Chairman-ship went to the Assistant Registrar, Co-operative Societies. The chief work consisted of recommendations for subsidy to Taluka Development Associations, systematizing the work of the District Agricultural Staff and of the co-operative department and supervising the same and recommending applications for loans for Agricultural Improvements.

B. P. VAGHOLKAR,
Deputy Director of Agriculture,
South Central Division,
Poona.

APPENDIX E

Annual Report of the Deputy Director of Agriculture, Southern Division, Dharwar, for the year 1926-1927

Staff and Organisation

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, throughout the year and was out on tour for 295 days. Mr. Dharwarkar who had been to America on study leave returned to his duties on 4th July 1926 and Mr. Shevade who acted for him reverted. Mr. Shevade was on privilege leave for three months from 4th July to 3rd October 1927 and acted as Personal Assistant to the Director of Agriculture for 3½ months from 13th February to 30th May 1927. Mr. V. N. Apte acted as Superintendent, Dharwar farm, during the absence of Mr. Shevade. Mr. G. L. Kottur, the Cotton Breeder, was on privilege leave for one month from 1st April 1927. Mr. R. Y. Hulkoti continued to act as Inspector of Agricultural Schools and Mr. Pavate as Head Master, Devi-hosur School. Mr. G. Y. Kurli continued to be on deputation. A temporary post of Bunding Officer was created by Government for Bijapur District and Mr. B. S. Channigeri was appointed to hold it from 1st October 1926, Mr. Albur being appointed to act in Mr. Channigeri's place as District Agricultural Overseer, Bagewadi.

The organisation of the District staff brought about in the year 1923-1924 was continued but the Agricultural Organisers went back to the control of the Assistant Registrars. The District staff continued to do both propaganda and organisation work.

Season

(2) The antemonsoon rains were insufficient and preparation of the land for sowing kharif crops was not very satisfactory. Monsoon rains in June were not also sufficient and sowing of kharif crops like paddy, groundnut, udid and potatoes could not be done in time in many places. Rains in July, however, were very valuable and most of the kharif crops were sown in that month. Rains in August and September were also good and all standing crops thrived well. The season up to the end of September was very bright and forecasts of all crops were excellent. Late rains in October and November, however, failed and kharif crops did not make any further appreciable progress. The yields were poor in general. Rabi crops were sown when there was just sufficient moisture in the soil for germination. They suffered badly from want of moisture during the whole period of their growth and gave very poor yields. The total rainfall was far below average during the year and most of it fell in the months of July, August and September. Absence of late rains in October and November spoiled the season.

(3) The work done by various sections is summarised under the same following heads as it was done last year to facilitate references and comparison where needed.

(*a*) Investigation and Experiments.

(*b*) Propaganda.

(*c*) Organisation.
(*d*) Direct services to the public.
(*e*) Agricultural Education.
(*f*) General.

Investigation and Experiments

(4) *Dharwar Farm.*—Plant breeding work on cotton, jowar and groundnut continued to receive close attention on this farm. A plot of 9 acres free from wilt adjacent to the farm was taken on lease for cotton breeding work which is increasing. Dharwar No. 1 x Rosea Cross strain No. 15 was compared with Dharwar No. 1 cotton in the new plot. The following are the details :—

Area under trial	Name of the cotton	Yield per acre	Ginning percentage
1 acre	Cross strain No. 15.	450 lbs. ..	34
Do.	Dharwar No. 1	375 lbs. ..	27

This strain is superior to Dharwar No. 1 in all its qualities except staple which is a bit shorter. The spinning tests made last year show that it is suitable for spinning upto 36s as compared with 40s of Dharwar No. 1 and 30s of Kumpta. This is a very promising strain for Southern Maratha Country and is being multiplied round Gokak and Bailhongal. Study of the other two strains Nos. 5 and 14 has not been hopeful. Strain No. 5 gins 36 but has a short staple. Strain No. 14 gins 38 and has a long staple 1·1 inch but it is unfortunately late and poor in yielding. Attempts to improve the yield have not yet been successful.

(5) Breeding wilt resistant types of cotton continued to receive much attention. The cross between Dharwar No. 1 x Wagale reached its 5th generation and Dharwar No. 1 x Dharwar No. 2, 4th generation. Selections of Wagale cross referred to in last year's report were further studied during the year but none of them was found to be pure for wilt resistance. Only one line 10-2-5 compared fairly well with Wagale and this will be tested for one season more. A few selections of Dharwar No. 1 x Dharwar No. 2 continued to be promising. The selections of strain Nos. 6 and 14 resisted wilt to the same extent and in a few cases even better than Dharwar No. 2. The seed of these two strains is preserved for trial. Selections in a few lines that have shown better degree of resistance than Dharwar No. 2 are also made. The cotton of strain Nos. 1, 6 and 14 is sent for spinning test. Strain No. 6 is more desirable than others at present. Its ginning percentage, staple and colour are all satisfactory and it has yielded also well. It is pure for all these characters and for wilt resistance. If it gives satisfaction in spinning test it will be recommended for cultivation in wilt affected areas.

(6) Attempts to isolate a strain possessing staple longer than that of Dharwar No. 1 and a strain ginning higher than Rosea among the cottons

from different parts of India, continued. Attempts in the first direction have not been successful. Three herbaceum cottons were obtained from Tachkant (Russian Turkastan) and grown during the year. Two of these did not yield any cotton. Of the 3rd (2519), one plant grown in pot produced cotton and its staple is found to be longer than that of Dharwar No. 1 being $1\frac{1}{4}$ inch. Flowers on this plant were selfed and the seed obtained is sufficient for further testing. If it is found to breed true, we shall have something new in staple. The plant is interesting from another point of view also. It produced about 20 bolls and all of them without any exception were four celled. As regards high ginning, Rosea gins 38 per cent. and it is, at present, the highest ginning pure strain with us. We are aiming at much higher percentage than this. The Indicum Molisoni of Punjab has yielded a strain that gins 39 per cent. K. 22 A. 19 (Cawnpore) and 27 W. N. (Sind) gin 40 per cent. Pwimbya (Burma) strain gins 42 per cent. Wagyi (Burma) varies very much in ginning percentage and staple, and by careful selection strains ginning 43 to 45 per cent. are isolated. Comilla gins very high. Some isolations give 48 per cent. but they are still not pure. We have thus a gradation in ginning percentage from 38 to 48.

(7) Selfing and multiplication of Dharwar No. 1 and Gadag No. 1 cottons on Dharwar farm, continued. Selfing was done on a larger scale than usual during the year. Up till now we used to raise 4 lbs. of selfed seed of Dharwar No. 1 every year, grow it on one acre by dibbling in the 2nd generation, and multiply it on 30 acres of the farm in the 3rd generation before it was sent out into the District. By this method we used to send out every year from the farm seed sufficient for 600 to 800 acres to be grown in seed growers' fields in the 4th generation. The seed raised in seed growers' fields was grown in a reserved area of 5,000 to 7,000 acres in the 5th generation and the seed therefrom sufficient for about a lac of acres was stocked for general distribution in the 6th generation. Due to mixing and certain crossing there is progressive fall in the purity of cotton especially in the last generation. Selfing was done on a larger scale therefore to multiply the seed more rapidly and meet the growing demand for seed of early generations. 43 lbs. of Dharwar No. 1 selfed seed were raised during the year against 4 lbs. in previous years. It will be dibbled on 15 acres on Dharwar farm against one acre in previous years in the 2nd generation and the seed therefrom grown in 300 acres of a farm owned by an association or private individual under careful supervision. This means that seed sufficient for 6,000 to 8,000 acres will be available for sowing in the 4th generation and for more than a lac of acres in the 5th generation. We shall be able to eliminate the 6th generation and thus improve the quality of cotton from our pedigree seed. Similarly 20 lbs. of Gadag No. 1 seed have been obtained by selfing and it will suffice to dibble 4 acres. Attempts will be made to multiply this too more rapidly than in previous years.

(8) *Other Cotton breeding work.*—Selections were made in Kumpta cotton for yield. Seed of Kumpta cotton was obtained from various places in the division and selection of high yielding plants was made from

the crop. Two Bailhongal strains seem to be promising and observations on these will be continued. Correlation between some characters is being studied in Kumpta cotton and some of its pure strains. Three years' observations are available and they will be examined some time during the rains.

Last year five cottons were sent for spinning tests. The highest counts to which these cottons are capable of spinning are Dharwar No. 1 (38 to 40s), Dharwar No. 1 x Rosea strain No. 15 (34s), Kumpta (30s), Gadag No. 1 (24s) and Dharwar No. 2 (20s).

(9) The effect of continued selfing on Dharwar No. 1 cotton was studied in detail. The crop after 12 years shows no deterioration in any of its characters (vegetation, growth, yield, number of flowers per plant, sterility of anthers, percentage of successful bolls, ginning percentage, staple and seed weight).

The Mutant in Wagale bred true for the characters noted last year. The absence of lint is specially interesting in the study of ginning percentage. The Mutant will, therefore, be maintained pure and made use of in crossing when necessary. Mr. Kottur, the Cotton Breeder, has sent a note on this for publication to "Nature."

(10) In jowar the promising strains of the principal local varieties, *viz.*, Fulgar yellow, Fulgar white, Nandyal, Bilichagan, Muddinandyal and Mahisal were grown by sowing each on five gunthas plot in one block and by dibbling each on two gunthas plot under more uniform conditions of spacing in another block for comparison of yields with a check of Fulgar yellow (ordinary seed). The selected strains fared better than check in both blocks. In the first block Nandyal 5-3 gave the best yield and in the second Bilichagan 5. These two strains are giving continuously good yields even in the general area of the farm. Arrangements are made to distribute these two varieties on a large scale round Dharwar. Selfing in all the selected strains continued for supply of pure seed. Twelve American varieties and a number of other local and introduced varieties having their specialities are maintained pure by selfing the earheads. The detailed account of jowar breeding work from 1920-1921 to 1926-27 is being ready for publication.

(11) In groundnut, the selected strains Nos. 4, 5, 10 and 15 were tested for yield. Strain No. 5 continued to yield better than others. In one plot it gave an yield of 1,852 lbs. against check 1,693 lbs. and in another plot 1,344 lbs. against 1,244 lbs. per acre. About 1,000 lbs. seed of this strain is available for multiplication. Seeds of different strains were sent to the Agricultural Chemist for testing oil percentage and they have been found to vary little. Late formed small seed, however, gives less percentage of oil (35 to 66 per cent.) than early formed well developed kernals (47·4 per cent.). The groundnut cultivation is spreading very rapidly all over the transition tract and good pure seed will have a great demand. Both breeding and district work on this crop need extension.

(12) Besides breeding work of cotton, jowar and groundnut, some useful experiments were conducted on Dharwar farm which are summarised below.

Crop Experiments.—Lucern as a dry crop was successful even in a dry year like the one under report. The yield of green fodder in four cuttings was 14,795 lbs. per acre. The crop of jowar (Muddinandyal variety) grown after lucern without any manure grew to a height of 14 feet and though suffered from want of rains in October it gave an outturn of 2,465 lbs. grain, 548 lbs. chaff and 7,048 lbs. kadabi valuing Rs. 164 per acre. Cost of cultivation was Rs. 22 and net profits Rs. 142. To see the effect of lucern on cotton in the third year, Dharwar No. 1 cotton was grown in a plot where lucern and jowar were grown in previous years. The crop made vigorous growth in the beginning but began to suffer from want of moisture in the month of October. An attempt was made to irrigate the crop, once in a portion and twice in another against an unirrigated Control plot. The results are interesting and are tabulated below :—

Treatment	Per acre			
	Seed cotton	Value	Cost of cultivation	Net profits
	Lbs.	Rs.	Rs.	Rs.
No irrigation	316	50	23	27
One irrigation	560	90	29	61
Two irrigations	968	155	38	117

The two irrigations increased the yield nearly three times. The advantages of lucern as a dry crop and its effect on the succeeding jowar crop have been published last year in Departmental leaflet No. 7. The trial of tobacco crop continued to be successful showing the possibilities of its introduction in the transition tract. The yield in this dry year was 700 lbs. per acre and net profits Rs. 63. The Departmental leaflet No. 10 published this year gives more detailed information. The trial of wheat varieties (Pusa 4, Pusa 12 and Bansi) continued. The season was quite unfavourable to wheat owing to want of late rains. The crop made very poor growth and gave low yields. Pusa wheats, however, gave better yields than Bansi 380 lbs. against 210 lbs. per acre.

(13) *Manurial Experiments.*—Results of artificial manure on cotton are very discouraging. Those of San green manuring are encouraging in one experiment while they are not in another. Further observations are necessary.

(14) In the small garden that is existing on Dharwar farm, figs and mangoes continued to receive attention. The new fig plantation is thriving well and hopes to yield economic results. Demand for mango grafts is increasing round Dharwar. Four hundred and twelve grafts were prepared and sold from the nursery started on the farm.

(15) *Gokak Farm.*—This farm conducted many experiments useful to the Gokak Canal tract and the following are the important ones.

The method of growing Maize with Tur as a row crop has passed its experimental stage and cultivators are taking to it. Maize with Tur was grown during the year on an area of 1 acre 16 gunthas for demonstration to the cultivators. The value of crops was Rs. 300, the cost of cultivation Rs. 118 and the net profit Rs. 182 per acre. This has appealed to the cultivators of the Canal tract. Maize after removing cobs was turned into silage and fed to the cattle with great advantage. This has also drawn the attention of the cultivators. Cotton as a rotation to sugarcane and other crops continued to pay well and the cultivators are taking to it. Maize with Tur and cotton crops save a good deal of canal water in the Rabi season and they should be encouraged by the Irrigation Authorities by differentiating the rates of these crops from those of other rabi crops. I have prepared leaflets during the year on (1) Maize with Tur, (2) Maize silage, (3) Cotton as rotation to sugarcane, and they deal with details. Yellow Mauritius cane continued to show better results than Pundia in Karl soil and some sets have been distributed to the cultivators for trial. Barbadose variety of cane is found to be more suited to the Gokak canal tract than Pundia and observations will be confirmed before attempts are made to introduce it in the canal tract. Among three varieties of tobacco crop Nadiad No. 6 has given more net profit than others (Sumatra or local). Lucern as an irrigated crop has given 42,919 lbs. green fodder in its third year. Results of three years are very encouraging and attempts will be made to introduce it as a fodder crop in the canal tract.

(16) *Manurial Experiments.*—Amophos has compared well with Ammonium Sulphate with net profit of Rs. 314 against Rs. 300 per acre. Pig manure is found to be very useful to cane and some cultivators are now making use of it. It was tried during the year also as a top dressing manure to sugarcane crop and results are good. Cultivators are being advised to use pig manure where it is available. In various top dressing experiments on sugarcane crop it is observed that a mixture of groundnut cake with other artificial manures gives better results and is essential.

(17) The fruit garden and the nursery on the Gokak farm have considerably developed. This section of the farm continued to work at a profit, the profits realised during the year being Rs. 717 against Rs. 539 last year. The new plantain and orange garden blocks will begin to yield from next year when profits are likely to be greater. Demand for guava and santra grafts and lemon seedlings is considerably increasing.

(18) *Mugad Rice Breeding Station.*—Out of 7 Mugad strains given out for trial in cultivators' fields, No. 146 was appreciated at Khanapur and No. 141 near Belgaum. Out of 6 Antarsal strains, No. 83 was appreciated at Bastwad and No. 200 round Mugad itself. Reports about others are not very encouraging. The distinguishing characters of 75 Mugad and 69 Antarsal individual strains were studied during the year. After intensive study of some selected strains, the Rice Breeder recommends 6 strains for trial during the coming season. The average superiority

of each of these six strains which he claims over the check samples is as under :—

Antarsal		Mugad	
Early No. 63..	10 to 16 per cent.	Early No. 161 ..	18 to 19 per cent.
Late No. 94..	9 to 11 per cent.	Intermediate No. 249.	20 to 23 per cent.
Late (Ginisali type).	No. 200 16 to 20 per cent.	Late No. 141 ..	14 to 21 per cent.

These will be compared with local seed of the same varieties in different places and results accurately measured. Botanical study on Gonag continued.

(19) *Tegur Cattle Breeding farm.*—The bull calves bred on Tegur farm continued to attract the attention of the cultivators. There is a considerable improvement in the 3rd generation. Nine bull calves and 4 cow calves were born and 7 bull calves sold during the year. The total number of the herd on 31st March 1927 was 138 valued at Rs. 7,705. Sheep breeding was continued to be a losing concern. Ten were born but 29 died during the year. The total number of sheep as stood on 31st March 1927 was 33 valued at Rs. 330. There is considerable improvement in the progeny of the cross with Merino ram, but mortality of the sheep has been very great. Tegur farm is very economically managed. The total expenditure on 138 cattle and 33 sheep was only Rs. 2,651 including the pay of the monthly men. Hay and silage was prepared and dry fodder crops were grown on the farm. Very little concentrated feed was purchased especially for young calves and cows which calved. Observations indicate that mixed farming is more paying than pure cattle breeding.

(20) *Experiments in cultivators' fields.*—As usual, the District staff laid out several experiments in cultivators fields ; but due to complete failure of late rains most of the crops including jowar and cotton failed to give yields worth recording. A few clear indications, however, have been noted. Of the several jowar strains from Dharwar farm, Bilichagan at Haveri and Savaner at Athani did better than local. Dharwar No. 1 cotton thrived better than Kumpta in all the places including Bijapur District. Gadag No. 1 cotton tried at Gadag did very well giving 605 lbs. of seed cotton per acre against 549 in the case of Dharwar-American and 409 lbs. of Cambodia. The New Cross cotton Dharwar No. IX Rosea which was compared with Kumpta at Bailhongal and Murgod has also satisfied the cultivators. Gadag No. 1 and the New Cross were compared with N. R. cotton under irrigation at Indi. The New Cross gave 1,200 lbs., Gadag No. 1 1,000 lbs. and N. R. only 655 lbs. yield of seed cotton per acre. Prospects of the New Cross to replace N. R. seem to be hopeful. The experiment will be repeated. Spanish peanut variety of groundnut (farm seed) was tried in various places and it is attracting the attention of the cultivators all over the transition tract. An experiment was conducted with 80 lbs. seed rate per acre against 40 lbs. (local practice) Haveri. Eighty lbs. seed rate plot gave 2,460 lbs. yield per acre against the local average of 1,400 lbs. Experiments with Ammonium sulphate, bone

meal and cake manure on paddy crops gave favourable results and their use is being strongly recommended. Ammonium sulphate was tried by 18 cultivators in Mundgod Petha during the year and they were all satisfied with the results. Bone meal has become popular round Khanapur. Applications of night soil to garden crops at Bijapur gave better results than farm yard manure and have induced garden cultivators to make use of this manure which was not at all used up till now.

Propaganda

(21) *District Cotton work*.—The Cotton staff attended to the work of multiplying Dharwar No. 1, Gadag No. 1, and Dharwar No. IX Rosea cross cotton in their different generations round Hubli, Gadag and Bailhongal respectively. The seed was sown under supervision, the standing crop inspected from time to time, the produce collected and ginned separately under careful supervision, and the seed obtained was cleaned and stocked for distribution during the coming season. The amount of work done during the year may better be summarised in the following statement than described :—

Name of the Variety	Generation	Quantity of seed distributed in lbs.	Area sown in acres	Quantity of produce in dokras	Quantity of seed stocked for distribution during the coming season
Dharwar No. 1 ..	3rd ..	720	76*	98	19,684
Do. ..	4th ..	3,920	339	244	43,008
Do. ..	5th ..	53,581	6,650	3,650	6,30,756
Gadag No. 1 ..	3rd ..	330	37	30	7,200
Do. ..	4th ..	800	795	356	83,100
Do. ..	5th ..	42,200	3,740	1,710	3,88,261
Dharwar No. IX Rosea.	3rd ..	150	14†	26	5,900
Do. ..	4th ..	1,500	160	66	11,340

* Includes 30 acres on Dharwar farm. † Includes 6 acres on Gokak farm.

(22) For distribution of 9 lacs lbs. of Dharwar No. 1 and 7½ lacs of Gadag No. 1 general seed, the officers of the Agricultural Department and sale societies worked together. Twenty-six Depôts were established for distribution of Dharwar Nos. 1 and 19 for Gadag No. 1 cotton seed. These include the seed societies. In addition to the above, Sardar Mahaboobalikhan stocked and distributed 2 lacs lbs. of Dharwar. No. 1 seed and Gadag Dalals' Association 2 lacs lbs. of Gadag No. 1. It is estimated that merchants of Hubli distributed 6 lacs lbs. of Dharwar No. 1 cotton seed and those of Gadag 3 lacs lbs. of Gadag No. 1 cotton

seed. The estimated areas in acres under these two cottons controlled and uncontrolled during the year are tabulated below :—

Name of variety	Area controlled by the cotton staff	Area controlled by the societies	Area uncontrolled Bazar seed	Total
	Acres	Acres	Acres	Acres
Dharwar No. 1 ..	7,492	171,000	111,000	289,492
Gadag No. 1 ..	4,604	58,396	62,000	125,000

The progress of these two cottons within the last four years has been very good but in limited tracts. Spread of Dharwar No. 1 cotton in Bijapur District through Cotton Sale societies, Bijapur and Bagalkot is being attempted. The Director of Agriculture kindly helped these two societies with a subsidy of Rs. 300 and a loan of Rs. 3,000 from his Personal Ledger Account. This was a very valuable help.

(23) The other important work done by the Cotton staff was grading in auction sales conducted by the Cotton Sale societies. In all 2,664 dokras of Dharwar No. 1 and 6,698 dokras of Gadag No. 1 cotton were graded against 13,260 and 11,151 respectively last year. The Hubli Sale society sold most of its cotton by private treaty. The Cotton Superintendent feels that it was an unwise step taken by the Hubli Cotton Sale society and that cultivators did not realise the benefits of auction sales.

(24) *Working of the Cotton Transport Act.*—Four hundred and sixty licenses by road for 14,792 dokras and 213 by rail for 5,562 dokras were issued to the cultivators of the Nizam's dominians and Madras Presidency bordering Gadag to bring in their cotton to Gadag market. Ten per cent. of all the consignments brought by rail was inspected at Gadag station and occasionally that which was brought in the market by roads. The import of fly and short stapled Khandesh cotton through rails has altogether been stopped but there are some reports that fly is smuggled into the Gadag Market without licenses to a certain extent and gets mixed with cotton. Attempts are necessary to stop this. At Bagalkot an office was opened temporarily for four months and 134 licenses were issued for 4,087 dokras to the cultivators of river side villages in the Bagewadi Taluka whose cotton is as good as that of Bagalkot. Two hundred and forty licenses for importing cotton seed for feeding purposes from Davangeri were issued from the office of the Deputy Director of Agriculture. The Cotton Transport Act worked well in the interest of the grower and the consumer of Kumpta and Dharwar-American cottons.

(25) *District general work.*—A series of demonstrations of all improved implements and successful crops under experiments referred to in paragraph 20 was arranged in all quarters of the Division as usual. The iron plough has fixed itself and needs no further demonstration. Special attention was given to the Circular chaff cutter. The Hand Circular chaff cutter was demonstrated freely but it has not been taken to. The progress of bullock gear chaff cutter demonstrated at Tallur and Murgod

was very satisfactory. Two hundred and eighty-six carts of kadbi have been chaffed by the cultivators and stacked. The working expenses came to Rs. 0-12-0 per 1,000 lbs. Messrs. Kirloskar Brothers were requested to manufacture bullock gears and suitable chaff cutters. They have prepared and sent two bullock gears but they have not yet prepared chaff cutters suited to their bullock gears. There seems to be scope for bullock and engine power chaff cutters in the dry tract of the Southern Division. Hand labour is becoming more scarce and costly. The wheat crop being very poor during the year, only a few demonstrations of wheat threshers were held. Three wheat threshers were prepared on Dharwar farm and supplied to the cultivators. The use of stone roller for threshing jowar is spreading of its own accord. Messrs. Kirloskars' Kisan cane crushing mill is becoming popular. Balsad and Mr. Shirgaonkar's Jaldev Rahats (bullock gear water lift) are becoming popular especially in Bailhongal Taluka of the Belgaum District. Macbeth Brothers' Tractor plough was demonstrated at Hosritti and Mantgani. The District Agricultural Association purchased one with Government subsidy and ploughed cultivators' lands on hire system. In 50 working days 157 acres of land were ploughed at an expenditure of Rs. 2,751 including cost of repairs but excluding depreciation. At the rate of Rs. 30 per acre for deep ploughing (12") and Rs. 20 for ordinary ploughing (9") the hire proceeds came to Rs. 3,912. The work of the tractor for deep ploughing has been very much appreciated by the cultivators and some Taluka Development Associations and big landlords are thinking of purchasing the machine during the coming year.

(26) Agricultural Conferences combined with Cattle Shows and implement demonstrations were held at Yamnur, Bijapur, Murgod and Mantgani where questions of direct utility to the tracts concerned were also discussed.

(27) *Propaganda against smut.*—This work was continued mainly through the Revenue Authorities. Demonstrations were conducted in all Taluka centres in the interior also. The total number of packets distributed during the year was 32,490 (Dharwar District 12,211, Belgaum District 4,840 and Bijapur District 15,439). Season for Rabi jowar continued to be unfavourable and demand from Rabi tract was only moderate.

(28) Lectures on agricultural improvements effected by the Agricultural Department and advice to individual cultivators who sought for it were given in various places.

Organisation

(29) Co-operative organisation among the cultivators for supply of agricultural requisites and sale of produce was freely preached to the people at the time of demonstrations and conferences. Attempts are being made to amalgamate small seed, implement and manure societies into Taluka Agricultural Requisite Supply societies to enable them to engage whole-time servants and carry their work more satisfactorily.

The work done by the small societies continues to be very limited and the Honorary workers are not taking much interest in developing them. Among all these small societies Betgeri, Kotumachigi, Mulgund, Saswihalli and Devi-hosur seed societies have turned out fairly good work.

(30) Among Co-operative Cotton Sale societies, Hubli and Gadag continued to do good work. The Gadag Sale society stood out of the local boycott and conducted four auction sales. The Hubli Cotton Sale society sold most of its cotton by private treaty and held only one auction sale. Attempts to improve Bijapur and Bagalkot Cotton Sale societies have been successful. The progress of Haveri Sale society under the new Managing Committee was much retarded. The amount of work done by various Cotton Sale societies is tabulated in the following statement :—

Serial No.	Name of society	Number of members	Share capital	Number of dokras sold	Value of cotton sold
			Rs.		Rs.
1	Hubli ..	2,450	16,420	18,150	8,82,266
2	Gadag ..	1,610	42,310	8,496	4,26,632
3	Dharwar ..	212	3,605	90	8,000
4	Annigeri ..	154	2,066	866	37,743
5	Haveri ..	554	6,510	620	32,000
6	Bijapur ..	136	2,495	2,210	72,308
7	Bagalkot ..	226	4,670	927	43,100
8	Bailhongal ..	214	2,750	5,204	2,08,032

(31) The Nipani Tobacco Sale society sold 75,258 lbs. of tobacco worth Rs. 71,000 against 56,640 lbs. last year and realised a net profit of Rs. 1,979 during the year. This continues to be a society largely of middlemen and attempts are being made to change its constitution. Tobacco growers should organise their own jarda making centres in rural areas and propaganda is being done for the same.

(32) The Sankeshwar General Sale society which started its operations during the year has made good beginning. It has sold 56,348 lbs. gul, 27,440 lbs. chillies, 5,512 lbs. jowar, 1,932 lbs. San fibre, 8,367 lbs. groundnut and some minor agricultural produce and has distributed 125 bags of ammonium sulphate in addition. The society has realised a net profit of Rs. 333 during the year.

(33) The Byadgi Chilli Sale society sold 7,912 bales of chillies and made a net profit of Rs. 4,546. The society sold much produce of the non-members. The number of members and share capital are both small and attempts are being made to increase them.

(34) Cattle Breeding societies continued to show good progress in Hirekerur Taluka of the Dharwar District. The Sidenur society has now two Mysore bulls and 110 local cows of its members. The progeny of the cross is much liked by the people. In other places the results are not very marked.

(35) *Fencing Societies.*—Arbhavi, Tadas and Kelgeri Fencing schemes attempted last year met obstacles and the progress has been very slow. It is hoped that Arbhavi and Tadas societies will be registered during the coming season. Kelgeri scheme will have to be dropped. Two new schemes—one at Bandur and the other at Kadankop have been taken up. In the absence of Legislation to force the minority to join the scheme approved by majority, the progress of Joint fencing schemes will not be satisfactory. A few individual cultivators purchased netted wire fence and enclosed their fields.

Campaign of removing prickly-pear against pig in Mundargi Petha continued during the year. It has been removed from 154 acres of land in all at a cost of Rs. 14,000 and nine villages have been saved from the attack of wild pigs. The prickly-pear committees are organising a Mahal Development Association to remove all the prickly-pear in the Mahal.

(36) *Other Land Development Societies.*—Yelvigi Waddars' joint cultivation society constructed bunds according to the plans given by the Bunding Officer of the Agricultural Department. Maharajpeth Joint cultivation society purchased bullocks and implements and has made a beginning. The proposed Shirur bunding scheme is waiting for takavi loan.

(37) *Taluka Development Associations.*—There are in all 11 Taluka Development Associations—6 in Dharwar District, 3 in Belgaum District and 2 in Bijapur District. Two more Associations are being organised in Belgaum District—one at Murgod and the other at Bailhongal. Each of the two bodies has collected an amount exceeding Rs. 3,000 and necessary surveys of the taluka have been made. They will be registered soon and the work started. The prickly-pear committees in Mundargi Petha of the Dharwar District are also working for a Mahal Association as I have stated in paragraph 35 above. Attempts to start such associations in other talukas are not yet mature. In the Dharwar District Gadag Taluka Development Association has taken particular interest in fodder storage and has collected about 3,000 kats of fodder. Haveri Association organised a show and conference and is working mainly on the spread of groundnut and its co-operative sale. Hirekerur Association did good propaganda on cattle breeding. Hangal Association was mainly engaged in solving the problems of Dharma Canal cultivators. Dharwar Association suspended its work for a time and has now recently collected 1,000 kats of fodder. Ron Association failed to do any work. In Belgaum District, the Athani Taluka Development Association has maintained its fodder stacks in good order and has collected many applications for well digging to be shown to Major Pogson. The Chikodi Association did good work on boring and top-dressing ammonium sulphate to cane crop and Gokak Association on distribution of copper sulphate packets against smut. In Bijapur District the Indi Taluka Development Association has improved its demonstration farm and has planted grape vine on a large scale. This Association has encouraged fruit cultivation to a great extent in its taluka. The Bijapur Association worked mainly on the application of night soil to garden crops and field

embankments. Scope for these associations to do useful work is very great but as I have repeatedly stated, their success depends on their financial position and the ability of their fieldmen.

(38) *The District Agricultural Association, Dharwar.*—Mr. V. S. Kulkarni of the Agricultural Department continued to work for the Association. The Implement work of the Association during the year was demonstrations of tractor plough. The Association with Government aid purchased one 15-30 B. H. P. MaCormic Deering tractor at a cost of Rs. 7,300, conducted two big demonstrations—one at Hosritti and the other at Mantgani and ploughed 157 acres of land on hire system. The work done by the tractor for deep ploughing has been much appreciated and some Taluka Development Associations and big landlords are thinking of purchasing such tractor ploughs during the coming season. The Association continued to hire out its iron ploughs and the hire proceeds amount to Rs. 187.

(39) The Divisional Board held its quarterly meetings regularly and discussed programmes of work and diaries of the District staff. The Officers' Divisional Conference was held in May 1927 when important subjects concerning investigations, experiments, propaganda and organisation were freely discussed.

Direct Services to the Public

(40) *Field Embankments.*—A special Bunding Officer was appointed for Bijapur District during the year. He and the District Agricultural Overseers prepared plans and estimates for 395 schemes costing Rs. 2,26,456 for an area of about 7,900 acres. Execution of works planned is in progress. The Collector of Bijapur continued to advance takavi loans and has arranged for proper supervision over execution of works. The other Bunding Officer worked mainly in Dharwar and Belgaum Districts. He prepared two joint schemes—one at Tallur and the other at Yelvigi. The joint schemes had many difficulties about the position of various bunds and waste weirs and they had to be solved. Distribution of cost in proportion to benefit derived is yet a problem not fully solved. Demand for advice on bunding has very much increased and cannot adequately be met with the existing staff. District Agricultural Overseers in Dharwar and Belgaum Districts are also being trained to do the work.

(41) *Boring.*—All the five machines continued to work. Three hand machines were converted into power ones. In all 34 bores were taken—25 in Dharwar District and 9 in Belgaum District. Of these, 24 were successful, 5 failures, 4 incomplete and 1 rejected. The total depth bored during the year was 3,518′-11″ against 3,561′-3″ last year. Taking into consideration the time lost in converting the hand machines into power ones the work done during the year was better than last year and far better than that of the year before last. The total receipts amounted to Rs. 4,160-7-0 against Rs. 4,389-7-0 last year. The details of each bore are given in Appendix A.

(42) Twenty-two pumps were fitted on surface bores. Help was given to Bailhongal Municipality in fitting their boring machine newly

purchased. The machines of Gadag and Kalghatgi Taluka Local Boards, Chikodi Taluka Development Association and Hubli Municipality were inspected at their request and necessary advice given to them. Recently two Departmental power machines working in the Belgaum District were handed over to the District Local Board.

(43) *The work of the Mechanical Assistant.*—He inspected in all 10 pumping sites during the year and prepared plans and estimates for them. He repaired the pumping plant at Yedal and charges of Rs. 15 recovered from the owner were credited into the treasury. He overhauled all the machinery on different farms including Bankapur, set them in order. He also attended to the repairing and overhauling work of the tractor belonging to the District Agricultural Association.

(44) *Karjagi Baling Plant.*—16,038 kats of kadbi was purchased during the year at a cost of Rs. 15,946. This came to 174 lbs. per rupee or Rs. 5-12-0 per 1,000 lbs. including cartage to the plant. It was cheaper than anywhere else in the Bombay Presidency where fodder operations were in progress. The plant commenced its work on the 1st of January 1927 with last year's kadabi and pressed 37,111 bales (3,043,341 lbs.) in all during the season. The working expenses for shredding and baling came to Rs. 5-2-3 per 1,000 lbs. The amount of work done during the year was considerably more than that of the last year but the working expenses are still high. All the pressed bales have been stacked in the open and thatched with bamboo matting and sugarcane pachat. The expenses of thatching came to Re. 0-9-4 per 1,000 lbs. In all we have 59,003 bales of kadabi in stock at Karjagi against famine.

(45) *Takavi loan applications.*—Besides those for bunding in Bijapur District referred to in paragraph 40 above, takavi loan applications amounting to Rs. 55,850 for land improvement were dealt with in Dharwar and Belgaum Districts. Various sites were inspected and estimates of schemes prepared before they were recommended. The work in this direction through Co-operative Societies and Revenue Officers is also largely increasing.

Agricultural Education

(46) The Agricultural School at Devi-Hosur completed its 13th year and during this period 138 students have passed out. The school continued to maintain its popularity and efficiency. Fifteen students in the first year, 16 students in the second year and 7 Vernacular teachers and one Kamgar under training received education during the year. All of them were occasionally taken on tour to study subjects which could not properly be taught at Devi-Hosur. The results of examination have been very good. Mr. Pavate the Head Master worked hard and with interest without any graduate assistant to help him. There is demand for an agricultural school in the Bijapur District and the District Local Board has consented to contribute Rs. 10,000 for initial and Rs. 1,000 every year for running expenditure. Among various sites inspected Torvi near Bijapur has been selected and proposals submitted by the

Director to Government have been administratively approved. There is also a demand for such a school in Belgaum District and the District Local Board, Belgaum, is considering over the matter. New Agricultural Bias classes were opened in Vernacular schools at Kagwad, Hudli, Sampgaon, Konnur, Parashwad, and Manoli in the Belgaum District. There are in all now 13 such bias schools in my Division. The examinations of all these schools were conducted by the Head Master, Devi-Hosur school, and the District staff of the Agricultural Department.

General

(47) It is very gratifying to note that the Departmental work in the Southern Division especially in the direction of bunding, fencing and spread of improved types of cotton has been very much appreciated by the people. The work is fast extending and the staff needs strengthening.

(48) Good many Revenue Officers and private gentlemen continued to help our propaganda and organisation work and my thanks are due to them. To the list of Revenue Officers, I have mentioned in paragraph 48 of my last year's report, I may add the names of Mr. V. H. Naik, the Collector of Bijapur, A. Master, the Collector of Dharwar, Mr. R. S. Hiremath, the District Deputy Collector, 1st Division, Dharwar, Rao Bahadur Koimbatore, the District Deputy Collector, S. D., Belgaum, Mr. M. S. Sashital, the Mamlatdar of Bailhongal, and Mr. Chikalgud, Mahalkari of Murgod, who gave considerable help and actually worked with me and my staff in various matters. Among the non-officials who helped the work of the Agricultural Department, the name of Mr. Fakirappa Laxmeshwar, President, Taluka Development Association, Gadag, deserves special mention for the year under report.

S. S. SALIMATH,

Deputy Director of Agriculture, S. D., Dharwar.

Detailed statement of Boring work

Serial No.	Name of Owner	Taluka	Village
1	Mr. Mulji Samji	....	Hubli ..
2	Convent School	....	Do. ..
3	Mr. V. S. Kulkarni	....	Do. ..
4	Mr. V. N. Joshi	....	Do. ..
5	Rao Bahadur Koppikar	....	Do. ..
6	Ubhayakar Brothers	....	Do. ..
7	Mr. G. N. Madiman	....	Do. ..
8	Dr. C. S. Patil	....	Do. ..
9	Mr. F. X. D'Mello	....	Do. ..
10	Mr. Govind Gowda	Gadag ..	Hulkoti ..
11	Mr. Vajeeralli	State ..	Savnur ..
12	Mr. Channappa Narayanpur	Do. ..	Do. ..
13	Mr. Shivappa Havangi	Do. ..	Do. ..
14	Guddi Masid	Do. ..	Do. ..
15	Police Lines	State ..	Savnur ..
16	Meherban Nawabsaheb	Do. ..	Do. ..
17	Shri Krishna Mandir	....	Hubli ..
18	Mr. Dinshaw	....	Do. ..
19	Mr. R. K. Shevade	....	Do. ..
20	Rao Bahadur Valvekar	....	Do. ..
21	Mr. H. M. Vadadekar	....	Do. ..
22	Mr. D. G. Bijapur	....	Do. ..
23	Mr. Chidamberrao	State ..	Savnur ..
24	Mr. Rangacharya	Do. ..	Do. ..
25	Satyabodha Swami Math	....	Do. ..
26	Dr. R. A. Kittur	Ungol ..	Konevadi ..
27	Do.	Do. ..	Do. ..
28	Mr. S. B. Karlekar	Belgaum ..	Belgaum ..
29	Mr. Hanamant Vishnu	Chikodi ..	Akol ..
30	Sanitary Committee	Do. ..	Do. ..
31	Mr. Narayan Dattatraya	Do. ..	Do. ..
32	Mr. Faiz A. Pathan	Do. ..	Nipani ..
33	Do. do.	Do. ..	Do. ..
34	Mr. Mahalingappa Kothivale	Do. ..	Do. ..

in Southern Division for the year 1926-27

Date of Starting	Date of Completion	Size of Bore	Depth of Bore	Water before boring gallons per hour
8 April 1926.	5 July 1926.	3"	225'	Surface ..
7 July 1926.	9 September 1926.	3"	203'	Do. ..
14 September 1926	30 October 1926.	3"	144'	Do. ..
3 November 1926.	30 November 1926	3"	117'	Do.
2 December 1926.	24 December 1926.	3"	114'	Do. ..
28 December 1926.	20 January 1927	3"	120'	Do. ..
24 January 1927.	18 February 1927.	3"	122'	Do. ..
11 April 1927.	14 May 1927.	4"	150'	Do. ..
16 May 1927.	3 June 1927.	4"	150'	Do. ..
15 June 1927.	.....	4"	64'	Well ..
15 June 1926.	25 July 1926.	3"	79'	Surface ..
27 July 1926.	19 August 1926.	3"	80'	Do. ..
22 August 1926.	27 September 1926.	3"	108'	Do. ..
30 September 1926.	27 October 1926.	3"	97'—8"	Do. ..
1 November 1926.	2 December 1926.	3"	109'	Do. ..
7 December 1926	13 February 1927.	3"	89'	Do. ..
7 April 1927.	27 April 1927.	4"	152'	Do. ..
29 April 1927.	21 May 1927.	4"	116'	100
26 May 1927.	9 June 1927.	4"	130'	Surface ..
12 June 1927	....	4"	135'—6"	Do. ..
20 February 1927	13th March 1927	4"	122'—0"	Do. ..
14 March 1927.	29 March 1927.	4"	125'	Do. ..
5 April 1927.	7 May 1927.	4"	146'	Do. ..
10 May 1927.	31 May 1927.	4"	129'—6"	Do. ..
4 June 1927.	....	4"	116'—3"	....
10 April 1926.	28 January 1927.	4"	69'—6"	Well 25
2 February 1927.	7 February 1927.	4"	37'	Surface ..
12 April 1927.	17 June 1927.	4"	76'	Well for drinking purpose.
27 September 1927.	26 November 1926.	4"	36'	Surface ..
15 December 1926.	12 January 1927.	4"	74'	Do. ..
19 January 1927.	25 February 1927.	4"	55'	Do. ..
10 March 1927.	2 April 1927.	4"	72'	Do. ..
12 April 1927.	20 May 1927.	4"	100'	Well
24 May 1927.	....	4"	135'—6"	Surface ..

Serial No.	Name of Owner	Water after boring gallons per hour	Dept. charges
			Rs. a. p.
1	Mr. Mulji Samji	300	312 8 0
2	Convent School	300	275 0 0
3	Mr. V. S. Kulkarni	200	191 0 0
4	Mr. V. N. Joshi	250	150 8 0
5	Rao Bahadur Koppikar	200	146 0 0
6	Ubhayakar Brothers	250	155 0 0
7	Mr. G. N. Madiman	240	158 0 0
8	Dr. C. S. Patil	250	200 0 0
9	Mr. F. X. D'Mello	250	200 0 0
10	Mr. Govind Gowda	....	....
11	Mr. Vajeeralli	200	108 10 9
12	Mr. Channappa Narayanpur	250	114 1 0
13	Mr. Shivappa Havangi	250	169 12 6
14	Guddi Masid	250	153 1 9
15	Police Lines	250	171 13 9
16	Meherban Nawabsaheb	150	125 10 9
17	Shri Krishna Mandir	250	203 0 0
18	Mr. Dinshaw	100	149 0 0
19	Mr. R. K. Shevade	250	195 0 0
20	Rao Bahadur Valvekar	....	....
21	Mr. H. M. Vadadekar	250	158 0 0
22	Mr. D. G. Bijapur	200	162 8 0
23	Mr. Chidamberrao	300	232 14 6
24	Mr. Rangacharya	300	287 12 9
25	Satyabodha Swami Math	....	....
26	Dr. R. A. Kittur	25	....
27	Do.	....	....
28	Mr. S. B. Karlekar	....	89 0 0
29	Mr. Hanamant Vishnu	....	....
30	Sanitary Committee	250	118 3 0
31	Mr. Narayan Dattatraya	200	57 8 0
32	Mr. Faiz A. Pathan	*Nil*	83 0 0
33	Do. do.	50	125 0 0
34	Mr. Mahalingappa Kothivale	....	....

Charges for Coolies and cartage	Cost of Fuel, Coal, etc., used	Cost of Casing pipe	Total cost of Bore	Cost per foot	General Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
....	....	....	....	....	Incomplete of last year. Completed this year.
					12' work was done this year.
339 14 0	3 2 0	172 4 0	790 4 0	3 15 0	
268 3 0	3 12 0	115 0 0	577 15 0	4 0 0	
156 4 0	8 4 0	100 0 0	415 0 0	3 9 0	
160 2 0	6 14 0	106 0 0	419 0 0	3 11 0	
158 2 0	7 2 0	112 0 0	432 4 0	3 12 8	
171 15 0	7 6 0	115 0 0	452 5 0	3 11 4	
102 8 0	55 12 0	*Nil*	358 4 0	2 6 0	
46 14 0	48 0 0	120 0 0	414 14 0	2 12 0	
....	....	....	....	....	In progress.
105 3 0	7 0 0	Include Department charges.	220 13 9	2 13 0	
111 6 0	4 8 0	Do.	229 15 0	2 14 0	
179 7 0	14 0 0	Do.	363 3 6	3 6 0	
148 8 0	13 0 0	Do.	314 9 9	3 4 0	
173 4 0	16 0 0	Include Bill.	361 1 9	3 5 0	
278 7 0	75 0 0	Do.	479 1 9	5 6 2	Rock being very hard, cost is more.
75 0 0	52 8 0	153 0 0	483 8 0	3 2 11	
78 12 0	67 0 0	150 0 0	444 12 0	3 13 4	
78 12 0	47 8 0	180 0 0	496 4 0	3 13 0	
....	....	....	....	....	In progress.
78 12 0	60 4 0	112 8 0	409 8 0	3 6 0	
67 8 0	35 0 0	110 0 0	375 0 0	3 0 0	
96 11 0	91 0 0	Include Bill	420 9 6	2 14 0	
80 0 0	62 0 0	Do.	429 12 9	3 5 3	
....	....	....	....	....	In progress.
167 0 0	80 0 0	*Nil*	....	....	Fail.
15 0 0	6 0 0	....	....	....	Exploratory bore fail.
170 0 0	125 0 0	*Nil*	384 0 0	5 0 0	Cost is higher owing to very hard rock. Owing to rain quantity of water could not be tried.
....	....	....	....	....	Rejected owing to accident.
75 10 0	68 0 0	Include bill	261 13 0	3 9 0	
109 6 0	97 8 0	*Nil*	264 6 0	4 13 0	
60 0 0	60 0 0	*Nil*	203 0 0	2 13 3	Owner discontinued at his wish.
87 0 0	51 4 0	*Nil*	263 4 0	2 10 3	Do. do.
....	....	....	....	....	In progress.

APPENDIX F

Summary of work done by the Deputy Director of Agriculture, Gujarat, Surat, for the year 1926-27

I. Staff

I was in charge of the Division during the year except for one month on leave from 18th January to 17th February 1927 when Mr. C. S. Patel acted in my place.

2. The Department lost one of its able men on 1st August 1926 in the death of Mr. G. N. Desai the late Divisional Superintendent of Agriculture, N. D. Mr. K. B. Naik who acted for Mr. G. N. Desai was confirmed as Divisional Superintendent of Agriculture, N. D., Ahmedabad, from 2nd August 1926. Mr. C. S. Patel, Cotton Superintendent, Surat, was appointed to act as Deputy Director of Agriculture, Konkan vice Mr. V. G. Gokhale deputed to Poona for 8 months and Mr. G. P. Pathak as Acting Cotton Superintendent, Surat, from 23rd March 1927.

II. Research and Experimental Work

(1) *Research on Crops*

3. *Cotton at Surat.*—The promising segregate 1027 Surat 5[1] gave an increase in yield of 37 lbs., 2·2 in ginning percentage and Rs. 15 more per Khandi over 1027 A. L. F. as against 90 lbs. in yield, 3·8 in ginning and Rs. 10 in valuation of last year. It is, however, found inferior to 1027 A. L. F. in actual spinning test in the current year as well as in the last year. Still as it fetches higher price than 1027 A. L. F., It will be tried on an area of 5 acres on the Surat Farm to arrive at a definite conclusion.

The detailed work on crosses is being published in a Pusa Memoir.

4. *Cotton at Broach.*—The yield of I A Broach 9[1] was superior to Broach local as in the last year. It was superior in ginning percentage by 3·3 as against 3·7 and by 4 counts as against 6 counts of last-year. This has been grown on a large scale on the Broach Farm and all the resultant seed has been distributed to the Members of Co-operative Societies for multiplication.

5. *Cotton at Viramgam.*—Seeds of Strains Wagad Pts. 4 and 8 were distributed, which gave very good results as compared with the local Cotton.

	Yield of seed Cotton in lbs.	Ginning Percentage	Staple length in cms.
Wagad Pt. 4	687	38	2·14
„ Pt. 8	799	41	2·04
Local Mandal	673	36	2·02

Pt. 8 is given out in villages round about Viramgam and Pt. 4 at Bavla in Dholka Taluka. 10,000 lbs., of seed of these two varieties have been distributed to cover an area of about 800 acres during the current season. Premium obtained for these improved Strains was Rs. 15 more per khandi than that of the Local Cotton.

6. *Jowar at Surat.*—The comparative results of strain Althan Deshi 6 were vitiated by the Borer attack. The trails in the districts were also inconclusive. It is being tried again this year.

Crosses between Dhorio of Rajkot and Althan Deshi 6 have been made to develop an earlier and high yielding strain.

7. *Jowar at Broach.*—Trial on the strains in the district will be continued to see if any of them is suitable for a particular tract.

New selections from cultivators fields were made for observation next season.

8. *Tobacco at Nadiad.*—The study of economic characters and the propagation of the selfed seed and Selection of the local varieties of Tobacco were continued.

Nos. 6, 20 and 22 have maintained their superiority for the past four years. Seed of Gandiu No. 6 was raised on an area of 1¼ acres just sufficient for planting 1,000 acres, next season. Peliu No. 28 will be grown on a small area for Demonstration. As the demand for seed has increased, a scheme for multiplication has been laid out by distributing Farm seed to certain registered seed growers who will grow the seed and will sell it back to the Department or to cultivators at 0-2-0 per oz. A list of such growers will be published as a Departmental leaflet.

Efforts are now being made to improve the quality of the Tobacco (strength) and Crosses have been made between Gandiu No. 6 X Bhengi, a Bengal type of Tobacco which is strong in flavour but low in yield.

Last year's Selections of Ahmedabad, Belgaum and Broach Districts Tobacco will be continued to find out development of economic characters. 3 fresh selections from Peliu have been made this year.

American types, white Barley Adcock and gold leaf were tried. They grow well but are low yielders. Burning character is not satisfactory. Crosses of Gandiu No. 6 X Adcock have been made with a view to get a variety with a better flavour and higher yield for making cigarettes.

Other investigations for increasing the yield by the use of manures and plant treatment are in progress.

(2) *Experimental Station Work*

9. (*a*) *Surat Agricultural Station—Cotton.*—An area of 56 Acres and 37 Gunthas was sown with pure selected seed of 1027 A. L. F. supplied by the Cotton Branch. The average yield of seed cotton was 371 lbs. as against 272 lbs. in surrounding cultivators' fields. Cotton seed obtained from the Farm produce was distributed to round about villages of Athwa Group.

10. *Jowar.*—The area under Jowar on the Farm was 67 acres and 21 Gunthas with an average yield of 742 lbs. in spite of severe attack of Stem-borer as against 592 lbs. on cultivators' fields.

11. *Ridge Experiment No. I.*—This has been discontinued and a portion of the area thus made free has been given over to the Cotton Physiologist, Surat. In the rest of the area Cotton Fertilizer was tried. It gave an increase of 29 per cent. in seed cotton on Ridges as against untreated plot. Last year the increase was only 9 per cent. which was negligible and did not cover the cost of the manure.

12. *Ridge Experiment No. II.*—This Experiment is being carried on for the last five years. The results are encouraging. Cotton on Ridges with 10 tons Farm Yard Manure in trenches gave an increase of 53·2 per cent.; that on Ridges with deep tillage in trenches gave an increase of 13·1 per cent. as compared with the Cotton crop on the check plot.

In Jowar the yield in grain was 49·3 per cent. more in case of Jowar on Ridges with 10 tons Farm Yard Manure in trenches, 23·8 per cent. and 13·3 per cent. more in Jowar on Ridges with deep and shallow tillage respectively as compared with the Jowar on the check plot.

The Experiment will be continued for one more year to complete the 3rd cycle of rotation as mentioned in the last year's Annual Report.

13. *Ridge Experiment No. III.*—This Experiment has completed its 2nd cycle of Cotton Jowar rotation. The average yield on ridged plot with 10 tons of Farm Yard Manure applied every alternate year and 4 cwts. of Castor-cake every year as top-dressing in case of Cotton showed an increase of 50·2 per cent. and in case of Jowar of 67·8 per cent. in grain and 105·6 per cent. in fodder as compared with the Flat plot.

In case of application of 4 cwts. of castor-cake alone the results are not so encouraging. In case of Cotton there is no appreciable increase in yield, while in case of Jowar there is an increase of 28·8 per cent. in grain and 53·8 per cent. in fodder showing thereby that the application of castor-cake is more beneficial to Jowar than to Cotton.

Efforts are being made to extend Ridge method of cultivation in the district also.

14. *Breeding Herd.*—A herd of pure Kankrej breed has been maintained for over 25 years to increase the milk yield of the breed by selection and for supplying best pedigree Bulls into the Surat and Broach Districts for improving the local breed which has deteriorated much by promiscuous and indiscriminate breeding.

The strength of the herd on the 1st April 1927 was 90 as against 112 of last year as some of the animals were sold off by auction sale for want of accommodation.

The total milk yield was 60,501 lbs. 8 ozs. with an average of 2,581 lbs. 14 ozs. per animal after deducting that of the newly calved and old animals.

As regards performance, out of the 6 families only Gopi family requires special mention here. It has been observed that almost all the

cows from this family yield 3,000 lbs. of milk per annum, enjoy longevity of life, the milk flow remains constant till last lactation and calve pretty regularly every year. Cows Anpurna and Amaraoti of this family have given an average of 3,321 lbs. and 8 ozs. for the last 12 years and 3,467 lbs. 8 ozs. for the last four years and four months respectively. The Dairy now possesses a Breeding Bull of this family.

Two breeding bulls were distributed during the year. There is a big demand for breeding bull but as the Diary did not possess a larger number, the demands could not be complied with.

(*b*) *Broach Farm*

15. A very small area of this Farm is reserved for Cotton and Jowar breeding work, for growing Crosses and Strains for comparison and multiplication of seed and the rest was leased out to a cultivator on condition to grow the seed supplied by the Department for multiplying the same.

(*c*) *Dohad Farm*

16. The same work of selection in Maize and Wheat was continued.

The tasseled and detasseled maize seeds have given better results than last year and 12,000 lbs. of pure seed of maize from the Farm area has been supplied to the Garbada Society.

Pure seed of Spanish Peanut Groundnut for 40 acres was supplied to the Mamlatdar of Co-operative Societies Dohad Taluka.

Baxi Pl. 7 and Pusa 4 Pl. 4 wheat strains were sown on an area of 18¾ Gunthas each and yielded 811 and 1,163 lbs. respectively per acre.

17. *Varietal Experiments Paddy.*—Kolumba Strain No. 42, Jirasal and Sutarsal were further tried and inspite of an unfavourable season yielded 1,432, 1,603 and 1,421 lbs. respectively per acre.

An area of 10 acres and 18 Gunthas has been acquired and added to the Farm.

18. *Cultural Experiments.*—The whole of this Farm area was sown with a drill 2' as against the ordinary practice of sowing after a plough and the marked success of straight and wider sowing was demonstrated to the Bhil and other cultivators of Dohad and Jhalod Talukas by holding two Party Demonstrations on the Farm in Kharif and Rabi seasons. Selected strains of wheat attracted great attention.

(*d*) *Amalsad Farm*

19. *Sugarcane.*—During the year under report there was no red rot in any of the sugarcane varieties grown on the Farm and in round about villages.

The same six varieties of sugarcane with an addition of Co. 205, reputed to be a heavy yielder, were grown on the Farm. Of the above 7 varieties, Red Sports, Manjav and Stripped Mauritius have kept up their reputation and are grown on a large scale in the tract. The Red Sports suits the middle of the tract, *i.e.*, just on the river bank and thrives best. Manjav is doing well in villages near sea coast while stripped Mauritius is doing

well on the other side of the river Ambika (Eastern parts) in the Gandevi Taluka.

Co. 210 and 213 are also good varieties for trials with brackish water and saltish lands. Their tillering capacity has been maintained. They are both hardy and thin. They in consequence require heavy charges for digging, stripping and crushing. They can profitably be grown on borders with soft canes in the centre.

The new cane Co. 205 is too thin and poor in extraction and yield and hence has been dropped from next year's cropping.

20. *Ginger.*—Slow irrigation and flat V/S bed system. An area of 2 gunthas on flat V/S bed was laid aside. The flat beds had irrigation channels on both sides but water was allowed to percolate through 1" holes in tin sheets. Water was allowed to run in all the small channels from the main channel at one and the same time and the irrigation of the flat plots was slow. The flats though received full quantity of water in this way were never flooded as is the case with beds, and have responded to this slow system of irrigation. The yield was 238 lbs. V/S 171 lbs. and hence there was a difference of 67 lbs. per 2 gunthas or 1,340 lbs. per acre.

21. *New Crops.*—Parwar Plantation has been doing well. From 4 gunthas including sale of cuttings Rs. 157-12-3 or Rs. 1,577-10-6 per acre were realised. Its cultivation has been extendng.

Plaintains.—Out of the 20 varieties planted last year the (1) Mutheli or Deshi, (2) Ponsari, (3) Red Velchi, (4) Basrai, (5) Bulsari and (6) Rajeli have done well. Mutheli has fetched the best price and hence all the year round for one season and takes 1½ to 2 years to finish up the crop. Ponsari is an early variety and fruits in 1 to 1½ years after planting and bears all the year round. Red Velchi bears heavily but requires supports otherwise it will break. The lower fruits are too small and do not develop due to nearness of fingers. Basrai is a green variety and does not command a good market as yellow golden coloured varieties are preferred. Bulsari is similar to Basrai, Rajeli is valued highly by the Parsis for vegetable purposes and fetches good price but is a shy yielder though fruits in 1 to 1½ years. The rest of the varieties are not suited to this tract.

22. *McGlashan Furnace.*—This is a C. P. Furnace. It was tried this year but did not give satisfactory work. It requires ¾ of an hour more per boiling; (2) the heat is uneven and (3) gul gets charred near the feeding mouth.

All available help was given to the cultivators of surrounding villages by giving them free for use, Iron Ploughs, Ridger and other implements and in obtaining for them artificial manures especially Ammonium Sulphate. The practice of planting sets is attracting better attention day by day and the area under this system is increasing.

(3) *Insect and other Crop-pests*

23. *Jowar stem-borer investigation.*—This was continued at Surat being financed from the Sir Sassoon David Trust Fund. The question of

hibernation has been tackled from various sides. A detailed study of its relation with temperature now explains the various behaviour of the pest Chilo simplex and shows that the temperature can play an useful part in the control of this pest. The work on parasites has made some notable progress though their rearing seems to be very difficult. Sesamia inferens which is the chief borer in Rabi Jowar was found very prominent in the latter stages even in Kharif Jowar. To completely check the attack of stem-borer, it will be necessary to have suitable methods of control of this pest also. All the results will soon be out in the form of a memoir.

24. *Katra (Hairy Caterpillar. Amsacta Moorei).*—The Katra attack was very serious throughout the whole of North Gujarat. An outbreak of this pest was also reported from Broach District this year for the first time. A study of the habits of this pest and the preparation of different types of baits for poisoning the caterpillars has been made and will be published shortly in the form of a bulletin. The work of controlling this pest will be continued with concentrated efforts next year.

25. *Investigation of Stored Grain-Pests.*—Rice weevil is observed to be the most important pest. The weevils are not found to feed on grains if the moisture content is reduced. Jowar grains exposed to the sun for a week in the month of May and the moisture contents reduced from 9·35 to 4·725 per cent. when stored in a galvanised tin bin were found to be quite free from insect attack throughout the monsoon even though the bin was frequently opened. Further investigations are in progress.

26. *Locusts.*—There was serious depredation of N. W. Locusts in Kathiawar and Ahmedabad District, and Cotton and Kharif and Rabi crops were badly damaged. Surface grass-hoppers and crickets did damage to Rabi crops in Surat, Broach and Ahmedabad Districts. Cotton stem-borer and onion Thrips were minor attacks in Surat. Remedial measures were suggested.

Arsenic and Strychnine packets were distributed and the success obtained in destroying jackals was 42 per cent.

(4) *Experimental Trials in the District*

27. *Cotton.*—In Surat District efforts were made to introduce 1,027 A. L. F. Cotton as a new crop at 7 places in Bulsar and 2 places in Pardi Talukas. The season this year was very unfavourable. Inspite of this the yield in one case was 320 lbs. per acre and in another 200 lbs. In Pardi Taluka, the crop suffered much due to continuous rains and failed. The crop has very nearly established itself in Bulsar Taluka, where the cultivation has extended up to about 1,000 acres. In Pardi Taluka the progress is rather slow but the cultivation will extend as the cultivators grasp the proper methods of cultivation of the crop. Ridge system is advocated here.

In Broach District square dibbling V/S drilling of cotton was tried and dibbling was found to be far economic and labour-saving. In Ahmedabad District 4,000 lbs. of 1,027 A. L. F. was distributed in South

Dascroi Taluka in 4 centres covering an area of 400 acres. Yields were poor and the area dwindled down to 200 acres due to wet season, though it made a better stand than the local. It ginned lower than the local Lalio which has a mixture of Ghoghari. This variety introduced in Halol fared a similar fate. Wagad strain 14 found favour at Ranpur and Gulasna extended over 200 acres. Strain No. 4 and No. 8 have done well at Bavla and round about Viramgam respectively and will be distributed next year.

28. *Rice.*—Seven hundred lbs. of Kolamba 42 produced at Ashlali was distributed over 20 acres at Ashlali, Bareja, Jetalpur and Lambha. It has stood well with Jirasal and gave an average yield of 2,450 lbs. and a maximum yield of 3,400 lbs. in two cases. The market has still not appreciated it as it is still grown on a very small area. Kolamba strain No. 79 was tried in 6 places in the Surat District. In one place it yielded 3,200 lbs. per acre and in two places 1,000 lbs. It rotted in three other places due to excessive rains.

29. *Wheat.*—Pusa 4 V/S Local Wajia gave excellent yields at Prantij and Modasa. In Eastern Mahals it is being taken up by the people in preference to Wajia. Baxi wheat from Dohad Farm has done well in very retentive or irrigated soils.

30. *Tobacco.*—Seventy lbs. of Strain No. 6 and 8 lbs. of Strain No. 28 were distributed in Kaira District. The nurseries and fields fared badly due to a wet monsoon and the net area under pure seed was 205 acres only. Both the strains yielded better than the local by 15 to 20 per cent. under irrigated and dry conditions. At Bavla they have done well. In Panchmahals and Dascroi encouraging results have been obtained and there is a brisk demand for the seed. The area next season will be about 1,200 acres.

31. *Groundnuts.*—Magdi variety was sown on 40 acres in Kalol taluka and has yielded better than the local variety. Distribution of seed has been taken up by the Kalol Co-operative Sale Society. In Dohad-Jhalod tract pure plantation of Spanish peanut extended on over 200 acres. As a result of the propaganda during the last 20 years the cultivation of groundnut has extended to 75,000 acres and oil extraction is taken up by about 50 Plants worked by Oil Engine. The cultivation will extend still more as better prices are realised.

32. *Manuring.*—Ammonium Sulphate has given very good results on Sugarcane, Ginger and Turmeric in the Surat District and hence a pretty big demand has been created. It is now stocked at Surat by Messrs. Gangaram Pranjivandas, local Agents of Messrs. Brunner Mond & Co.

Sodium Nitrate and Bone meal were distributed in a fairly large quantity in Kaira District for tobacco, rice and Jiru crops. The net profit obtained is not sufficiently attractive for general adoption.

Cotton Fertilizer was tried this year also but the results are not encouraging.

(5) *Miscellaneous Trials, adoption of new methods, etc.*

33. *Ridge Cultivation.*—As there was no break in the monsoon, preparation of ridges was not possible after the rains. In spite of that an area of 50 acres was ridged by P. & O. Middle Buster in Olpad Taluka.

All the cultivators who sowed their cotton on ridges fared well and had not to resow their crops. Cultivators were very much impressed with the success of Ridge Cultivation in a very wet year like the one under report.

III. Organisation and Propaganda

34. (*a*) *Organisation.*—In addition to the Propaganda Staff mentioned in paragraph 37 of last year's report one District Agricultural Overseer was posted at Dholka under the Divisional Superintendent of Agriculture, N. D., Ahmedabad and two Agricultural Overseers, have been posted under the District Agricultural Overseer, Surat, with their head-quarters at Bulsar and Olpad.

The Deputy Director of Agriculture, Gujarat was Chairman of the Divisional Board of Agriculture for Gujarat till 31st October 1926. Since then the Assistant Registrar, Co-operative Societies, N. D., Surat, is the Chairman as per Government Resolution No. 4062/24 dated 17th May 1926, Revenue Department.

35. *Co-ordination of the activities of the Agricultural and Revenue Departments*, for the introduction of certain improvements, was fully achieved in all the Districts in this Division. The Revenue Department co-operates in right earnest and as a result of it *Taluka Development Associations are being more rapidly formed.*

36. *Taluka Development Associations.*—Borsad Taluka has now started a Taluka Development Association with Rs. 12,000 as initial funds and Rs. 5,000 have been donated by Mr. Bhailal Amin of Virsad for a Scholarship in the Agricultural College, Poona. In Pardi Taluka with the help of Khan Bahadur V. P. Bhiladwalla and Mr. M. M. Shah, Mamlatdar of Pardi and the fullest sympathy of Mr. K. L. Panjabi, I.C.S., Assistant Collector, S. P., Surat, a Taluka Development Association has been started on 5th of June 1927. The Chorshi, Jalalpore, South Daskroi and Anand Taluka Development Associations are doing good and useful work. Anand and Borsad Taluka Development Associations have been duly registered under the Co-operative Societies' Act. The formation of Taluka Development Association, Olpad, Halol, Kalol, Nadiad and North Daskroi had to be postponed due to two consecutive bad seasons and demands of Presidency Agricultural Shows and other Funds.

37. *Agricultural Associations.*—Nadiad, Thasra, Kapadvanj and Mehmadabad Associations in Kaira District were revived and distribution of seeds and manures and demonstration of Improved Implements was conducted there. A new Association was formed at Matar with 200 members and Rs. 450 as Capital. It distributed Kanmi Cotton and Soda Nitrate Manure and purchased a Chaff-cutter for demonstrating its economic use. Prantij Association pays rent of Implement

Depôt and conducts trials of groundnuts, Bajri, etc. Chikhli Association gave out implements free for use and it is expected it will soon take up more activities.

38. *Non-Credit Agricultural Co-operative Work.*—The activities of the District Agricultural Overseers, in Broach, Kaira, Panch Mahals and Ahmedabad District and of the Agricultural Organiser, Co-operative Societies, in the tract south of the Narbudda were diverted towards the supervision of the existing societies and organisation of new ones. The total number of Non-credit Agricultural Co-operative Societies during the year was 36. Besides, Co-operative Credit Societies at Nava Falia (Taluka Dohad) and Kalol undertook to distribute improved seeds to their members.

(*b*) *Departmental Propaganda Work*

39. *Cotton Transport Act.*—Was relaxed with regard to transport of cotton from the zone north of the Tapti to south, as the Co-operative Societies in Olpad Taluka agreed to grow 1,027 A. L. F. Cotton. But the results do not seem to be satisfactory and it is feared that original restrictions will have to be imposed.

40. *District Cotton Work—Surat Tract.*—The total area under control of the Department was 9,103 acres and 11 gunthas against 11,617 acres and 24 gunthas of last year, the whole area being under 1,027 A. L. F. The total quantity of Kapas handled by the Department from the controlled area was 2,039 Bhars and 18 maunds yielding 786 Khandies of lint. The premium realised was Rs. 15 to Rs. 20 per Khandi. In addition to the above 472 Khandis of lint belonging to Hansot, Sarbhon and Ranveri-Khurd Co-operative Cotton Sale Societies which grew pure 1,027 A. L. F. was sold through the Department and they realised a premium of Rs. 10 to Rs. 20 per Khandi.

41. *Seed Distribution.*—The total quantity of seed purchased from the Director of Agriculture's Personal Ledger Account was 1,881 gallis and 12 maunds and a sum of Rs. 1,00,000 was obtained from the Director of Agriculture, B. P., Poona. The above quantity of seed was distributed in tract below Narbudda by opening Depôts at various places and to the Rajpipla and Chhota Udepur States.

42. *Broach Tract.*—Two thousand six hundred and ten lbs. of seed of the improved type 9^1 found suitable for the Broach Tract, was distributed to the members of the Dabhali Co-operative Cotton Sale Society and other selected cultivators for further multiplication in the coming season.

43. *Northern Gujarat Tract.*—As stated in paragraph 5 above seeds of the improved types of Wagad Pt. 4 and Pt. 8 were distributed for further multiplication in an area of about 800 acres.

44. *Demonstrations and Shows.*—As there was a big Presidency Show at Poona, the programme of Demonstrations and Shows was curtailed. Fourteen general demonstrations were held, 2 in Broach, 8 in Panch Mahals, 3 in Kaira and one in Ahmedabad District. Special Demonstrations 3 of Tractors, one of Mowing Machine and one of

Chaffcutter were held in the Surat District. German Tractor LANZ 38 B. H. P., working on Crude oil was worked at Wagaldhara, taluka Bulsar, John Deere Tractor at Abrama, taluka Jalalpore and Cletrac Tractor on the Surat Farm. All the three gave a good performance. One hundred and fifty-eight Petty Demonstrations of the working of Improved Implements were also held, 15 in Surat, 11 in Broach and 132 in Ahmedabad, Kaira and Panch Mahals Districts. Insect Demonstrations and Magic Lantern Shows were held in two places.

45. *Presidency Shows.*—In the Poona Show held in October 1926, 926 samples were sent in the Field Produce Section. District Committees were formed and the District Agricultural Overseers helped the Secretaries and conducted vigorous propaganda to popularize the Show. Nearly 1,000 cultivators from North Gujarat and 1,500 from South Gujarat visited the Show. Three Gold Medals, 1 Silver and 7 Bronze medals and Rs. 50 in cash were won by the Kaira District. Eight Bronze medals and Rs. 73 in cash were won by the Surat District. Panch-Mahals and Ahmedabad stood 3rd and 4th.

A Presidency show is to be held at Ahmedabad in December 1927. The Deputy Director of Agriculture, Gujarat, is the General Secretary. Preparations for the Show are in progress. Propaganda work is being carried on by the Propaganda Staff and Taluka Development Associations, and samples of the Field Produce are being collected from now.

IV. Service

46. *Implement and Seed Depôts.*—The six depôts were continued. The total hire charges earned by them were Rs. 77-14-0 as against Rs. 54-1-0 of last year.

47. *Distribution of Seeds, Manures and Implements.*—(1) *Seeds*—In all 95,039 lbs. of seed was distributed (excluding those distributed by the District Cotton Staff in Lower Gujarat), important of which were 6,680 lbs. Sann in Broach; 50,640 lbs. second hand Farm Cotton seed in Kaira District; 5,760 lbs. of 1,027 A. L. F. in Ahmedabad District; 740 lbs. Kolamba Paddy Strain No. 79 in Surat District, Fruit plants worth about Rs. 1,500 were also distributed.

(2) *Implements.*—In Surat District Implements worth Rs. 472-12-0 including one Mowing Machine were distributed. In Broach 14 more Malwa Ploughs were introduced. Two Disc Harrows, 3 B. T2 Ploughs, one Monsoon Plough, 6 Pruning instruments were distributed in North Gujarat. Spares of various improved implements were also supplied.

(3) *Manures.*—In all 530 cwts. and 20 lbs. as against 273 cwts. and 104 lbs. of last year were distributed of which the important ones were Ammonium Sulphate, Bone-Meal, Denatured salt, Sodium Nitrate and Cross-Fertilizers.

(4) *Budding.*—One thousand two hundred and eighty-three buds have been inserted in Bor trees and 198 Mangoes have been grafted with the help of an expert Mali sent by the Horticulturist. Applications for budding of 2,000 bors and grafting of 148 Mangoes are still pending.

48. *Boring.*—One more Boring Machine a Calyx Drill was added this year bringing the total number of Machines in this Division to 7. Fifty-six applications were registered for boring. Fifty-one new bores were undertaken in addition to the 5 left incomplete last year; out of these 56 bores, 33 were successful, 20 unsuccessful and 3 incomplete (*vide* detailed statement appended). The total depth bored during the year was 3,376 feet and the total quantities of water tapped was 330,315 gallons per hour and the result of the success was 62·27 per cent. The failure was due to insufficiency of water in five cases. Brakish water in seven cases, un avourable strata of hard rock in seven cases and an accident in one case. Out of 10 accidents 9 could be successfully recovered. Machine No. 14 was worked in the Jalalpore Taluka in consultation with the President Jalalpore Taluka Development Association. Ten Bores were undertaken in this Taluka, out of which four bores were successful. In case of four bores the water supply was insufficient and two bores had to be abandoned due to unfavourable strata encountered. The total expenditure including that of Permanent Boring establishment during the year amounted to Rs. 20,541-0-9; total recoveries of Boring charges were Rs. 3,584-14-10, those in arrears being Rs. 5,132-4-2.

49. *Mechanical Help.*—The Mechanical Assistant got 41 enquiries including 6 pending of last year; out of which 33 were attended, 3 filed and 5 are in arrears. These included 18, 9, 9, 4, and 1 from Surat, Broach, Kaira, Ahmedabad and Panch Mahals respectively. Out of 122 works in all executed by him 14 belonged to Government, 105 to individual cultivators, 2 to Co-operative Societies and one to Local Board. These included inspection of 59 Pumping plants and giving advice to their owners mostly in Borsad Taluka. He was on privilege leave for one month during the year. He was out on tour for 186 days during the year, out of which he spent 28 days in executing Government works and 158 days for cultivators. There was no occasion to call him for the same work a second time and hence no fees were charged for the help to the cultivators during the year.

V. Agricultural Education

50. *The Vernacular Agricultural Schools at Godhra* (*started in 1920*) *and Surat* (*started in 1923*) opened their classes with 30 and 33 students respectively. The number of applicants seeking admission to the Godhra and Surat Schools were 51 and 40 respectively of which 16 and 16 were admitted in the fist year. Out of the 16 boys admitted at Godhra 7 left leaving 9 in the first year; two boys left the Surat School. The result of their Annual Examination held in April 1927 were:—

	Number of boys				Remarks
	In Godhra		In Surat		
	Appeared	Passed	Appeared	Passed	
1st year	9	6	14	12	
2nd year	14	11	17	15	

The total expenditure of the Godhra and Surat Schools during the year was Rs. 10,434-12-0 and Rs. 12,845-8-0 respectively of which Rs. 500 were received from the Sir Sassoon David Trust Fund in each of the Schools and Rs. 200 and Rs. 1,000 from District Local Board, Panch Mahals and Surat respectively. Total receipts of the Godhra and Surat Schools were Rs. 824-4-10 and Rs. 346-13-11 respectively as against Rs. 963-10-3 and Rs. 1,216-6-1 of last year. The average feeding expense per boy per month to Government was Rs. 10-4-0 and Rs. 10-0-0 respectively and that of the whole institution Rs. 30 and Rs. 32 respectively. One weaving shed has been added to the Godhra School, while weaving and Implement sheds and temporary Quarters for Assistant Masters and necessary additions to the Work-shop have been made in the Surat School.

51. *Agricultural Education to the Students of Primary Schools.*—This was continued at the Dharala Boarding School adjoining the Vernacular Agricultural School, Godhra by the staff of the latter.

52. *Training of five more Primary School Teachers* was undertaken at Godhra out of which one Teacher from Broach District failed and four passed out. These Teachers are meant for introduction of Agricultural Bias Course in Rural Schools.

VI. Publications

53. The publication of the Broach Quarterly Magazine was continued besides publishing articles on agricultural matters in local papers. In all 43 articles were published by the Agricultural Staff of this Division. The Departmental Publications for which material was supplied by the Officers from this Division during the year were :—

Memoirs.—(1) On Gujarat Cottons, Part- IV, by Messrs. M. L. Patel, Cotton Breeder, South Gujarat, Surat and S. J. Patel, Graduate Assistant, under the Cotton Breeder, South Gujarat, Surat.

Bulletins.—(1) No. 129 of 1927—The Treatment of Patches of Inferior Tobacco in North Gujarat by Messrs. M. L. Patel, Cotton Breeder, South Gujarat, Surat and V. M. Majmudar, Tobacco Breeder, Tobacco Research Station, Nadiad.

(2) No. 132 of 1927—The Improvement of Tobacco in North Gujarat by Dr. Harold H. Mann, D.Sc., Director of Agriculture, Bombay Presidency, Poona, and Messrs. M. L. Patel, Cotton Breeder, South Gujarat, Surat, and V. M. Majmudar, Tobacco Breeder, Tobacco Research Station, Nadiad.

Leaflets.—Leaflet No. 4 of 1926 on Katra or Hairy caterpillars of Gujarat.

Leaflet No. 5 of 1926 on New Type of Tobacco Strain No. 6.

54. A book named " Kitak-Shastra " in Gujarati, was published by Messrs. B. J. Thakar, Entomological Assistant, Surat and N. L. Desai, Head Master, Vernacular Agricultural School, Surat. It supplies a long-felt want.

VII. Conclusion

55. The work done by the staff under me was on the whole very satisfactory.

Messrs. V. D. Desai and M. S. Bhatye have continued to work with the same zeal and energy as was evinced during the last year.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat, dated the
28th July 1927.

Statement showing particulars of Bores undertaken in 1926-27 in Gujarat Division

Statement showing particulars of Bores

Serial No.	Name of the well or land owner	Taluka	Village	Date of commencement
1	2	3	4	5
		Bores left incomplete before 30th June 1926		
	Ahmedabad District			
17	Lakhabhai Shankerbhai	South Daskroi ..	Vasai ..	27 May 1926 ..
18	Narottam Bhaljibhai	Sanand ..	Manipur ..	3 June 1926 ..
	Surat District			
6	Cotton Spinning Mills, Surat ..	Chorashi ..	Surat, Begamwadi	15 October 1925 10 September 1925.
21	Framroj B. Garda	Jalalpore ..	Abrama ..	24 June 1926 ..
22	Pirojshaw Vicaji Bhiladwala ..	Pardi ..	Pardi ..	26 June 1926 ..
	Ahmedabad District			
1	Sheth Tribhovandas Chhagalal ..	Sanand ..	Godhavi ..	25 July 1926 ..
2	Sheth Harilal Bhudardas	Do. ..	Do. ..	20 August 1926 ..
3	Vaghela Bakorbhai Motibhai ..	Do. ..	Do. ..	10 November 1926.
4	Rev. Sammuel Kerr	Do. ..	Nedhrad ..	29 November 1926.
5	Jivanlal V. Desai	North Daskroi ..	Khodiar ..	11 December 1926.
6	Fakirchand Jethabhai	Sanand ..	Goraj ..	22 December 1926.
7	Jivanlal V. Desai	North Daskroi ..	Khodiar ..	28 December 1926.
8	Amratlal Sankalchand	Sanand ..	Sanand ..	8 January 1927 ..
9	Mohanlal Sakarlal	Do. ..	Do. ..	19 January 1927.
10	Hosangji Barjorji Vakil	South Daskroi ..	Vatva ..	21 January 1927.
11	Do.	Do. ..	Do. ..	5 February 1927.
12	Hirabhai Punjabhai	Sanand ..	Sanand ..	12 February 1927.
13	Mulchand Vardhman	Do. ..	Do. ..	6 March 1927 ..
14	Keshavlal Chatoorbhai	Do. ..	Popatpura ..	6 March 1927 ..
15	Bhavsing Parbhudas	North Daskroi ..	Silaj ..	4 April 1927 ..
16	Vallabhbhai Shivabhai Patel ..	Do. ..	Gota ..	16 May 1927 ..
17	Local Board well	Sanand ..	Bakrana ..	31 May 1927 ..
18	Tribhovan Devidas	Do. ..	Laypura ..	13 June 1927 ..

undertaken in 1926-27 in Gujarat Division

Date of completion	Actual No. of working days	Total depth of boring	Diameter of bore	Water before boring in gallons per hour	Water level before boring	Water after boring in gallons per hour
6	7	8	9	10	11	12
and completed after that date		Feet	Inches		Ft. In.	
17 August 1926.	53	(200) 61	4	1,000	12 0	1,000
22 July 1926..	....	180 55	3	....	....	....
11 December 1925. 16 September 1926.	36	(88)	4	1,000	22 0	1,000
13 July 1926..	7	(56) 20	4	....	....	1,000
2 July 1926 ..	4	(42) 9	6	....	....	About 500 gallons in bore per hour.
19 August 1926.	10	63 from ground surface.	3	.....	....	500
31 October 1926.	20	115	3	225	11 0	1,225
26 November 1926.	9	26	3	500	18 0	1,500
18 December 1926.	11	93	3	....	3 0	1,000
26 December 1926.	7	24	4	1,000	8 0	1,500
5 January 1927.	10	101	3	....	....	500
10 January 1927.	7	29	4	1,000	7 6	1,500
20 January 1927.	9	40	3	500	19 0	1,500
9 February 1927.	15	120	3	....	....	1,500
4 February 1927.	6	36	4	1,000	15 0	2,000
31 March 1927	28	104	4	2,000	15 0	5,000
4 March 1927.	3	64	3	1,000	37 0	2,000
31 March 1927	19	84	3	1,000	9 0	2,000
29 May 1927..	42	210	3	....	....	500
29 April 1927.	14	56	4	500	5 0	1,000
....	....	70	4	....	....	....
10 June 1927.	5	41	3	500	16 0	1,500
21 June 1927.	6	50	3	500	15 0	1,500

Serial No.	Name of the well or land owner	Water level after boring	Increase of water supply	Flat charges
1	2	13	14	15
		Feet	Gallons	Rs. a. p.
	Ahmedabad District			
17	Lakhabhai Shankerbhai	12	....	....
18	Narottam Bhaijibhai	....	....	....
	Surat District			
6	Cotton Spinning Mills, Surat ..	22	....	....
21	Framroj B. Garda	4	1,000	59 0 0
22	Pirojshaw Vicaji Bhiladwala ..	....	500	42 0 0
	Ahmedabad District			
1	Sheth Tribhovandas Chhagalal ..	37′ from ground surface.	500	69 8 0
2	Sheth Harilal Bhudardas	15	1,000	147 8 0
3	Vaghela Bakorbhai Motibhai ..	18	1,000	26 0 0
4	Rev. Sammuel Kerr	Water in pipe 15′ high.	1,000	114 8 0
5	Jivanlal V. Desai	8	500	24 0 0
6	Fakirchand Jethabhai	Water 15′ below surface.	500	126 8 0
7	Jivanlal V. Desai	9	500	29 0 0
8	Amratlal Sankalchand	21	1,000	40 0 0
9	Mohanlal Sakarlal	Water 30′ below ground level.	1,000	....
10	Hosangji Barjorji Vakil	17	1,000	36 0 0
11	Do.	15	3,000	131 0 0
12	Hirabhai Punjabhai	37	1,000	71 0 0
13	Mulchand Vardhman	9	1,000	101 0 0
14	Keshavlal Chatoorbhai	17′ below surface	500	290 0 0
15	Bhavsing Parbhudas	5	500	59 0 0
16	Vallabhbhai Shivabhai Patel ..	....	....	....
17	Local Board well	19	1,000	41 0 0
18	Tribhovan Devidas	15	1,000	50 0 0

Cost of pipes and shoes 16	Labour charges 17	Cost of fuel, lubricating oil, coal, etc. 18	Total cost 19	Cost per foot 20	Result 21
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
227 0 0	200 0 0	60 0 0	487 0 0	2 6 11	Bore abandoned as saltish water tapped.
....	....	....	....	....	Left incomplete at well owner's request.
139 8 0	150 0 0	41 0 0	330 8 0	3 12 1	Failure. Water saltish.
111 0 0	52 8 0	7 4 0	229 10 0	4 1 7	Successful.
..	20 0 0	23 4 0	85 4 0	2 0 5	Do.
80 0 0	40 0 0	15 4 0	204 12 0	3 4 0	Successful.
132 0 0	101 0 0	26 8 0	407 0 0	3 8 7	Do.
43 0 0	60 0 0	19 4 0	148 4 0	5 11 2	Do.
154 0 0	80 0 0	22 8 0	371 0 0	3 15 1	Do.
63 0 0	86 8 0	10 12 0	183 10 0	7 1 5	Do.
118 0 0	72 0 0	20 14 0	337 6 0	3 5 5	Do.
70 8 0	90 0 0	14 2 0	203 10 0	7 0 4	Do.
60 0 0	47 0 0	15 4 0	162 4 0	4 0 4	Do.
137 0 0	67 8 0	25 0 0	229 8 0	1 15 7	Water tapped unfit for irrigation purposes and hence failed.
72 0 0	95 8 0	16 4 0	219 12 0	6 1 8	Successful.
170 0 0	141 0 0	65 0 0	507 0 0	4 14 0	Do.
87 0 0	20 0 0	11 4 0	189 4 0	2 15 4	Do.
104 0 0	85 8 0	26 8 0	317 0 0	3 12 5	Do.
227 0 0	126 0 0	45 0 0	688 0 0	3 4 5	Do.
98 0 0	57 4 0	26 8 0	240 12 0	4 4 9	Do.
....	....	....	....	....	Incomplete.
58 0 0	31 8 0	11 4 0	141 12 0	3 7 4	Successful.
67 0 0	20 0 0	15 4 0	152 4 0	3 0 9	Do.

Serial No.	Name of the well or land owner	Taluka	Village	Date of commencement
1	2	3	4	5
	Surat District			
1	Keshavram Ruderji	Bulsar ..	Bulsar ..	13 August 1926 .
2	Daulatrai N. Desai	Jalalpore ..	Kharsad ..	24 October 1926.
3	R. A. Smithwick	Chorashi ..	Udhna ..	26 October 1926.
4	Gulabbhai D. Desai	Bulsar ..	Atakpardi ..	13 November 1926.
5	Ranchhodbhai Premabhai ..	Jalalpore ..	Khadsupa ..	14 November 1926.
6	Jinabhai Bhimbhai	Bulsar ..	Atakpardi ..	7 December 1926.
7	Rustomji Manekji Patel	Olpad ..	Bhesan ..	6 December 1926.
8	Manibhai Bhimbhai	Chikhli ..	Bamanvel ..	10 December 1926.
9	Maganlal Gopalji	Bulsar ..	Atakpardi ..	20 December 1926.
10	Manibhai Bhimbhai	Chikhli ..	Bamanvel ..	30 December 1926.
11	Govind Hari Bhana	Bulsar ..	Bulsar ..	9 January 1927 .
12	Paragjibhai Parbhubhai	Jalalpore ..	Khadsupa ..	19 January 1927.
13	Gopalji Mohanji	Bulsar ..	Atakpardi ..	20 January 1927.
14	Nanabhai Naranji	Jalalpore ..	Kanbad ..	1 February 1927.
15	Paragji Parbhubhai	Do. ..	Khadsupa ..	5 February 1927.
16	Rustomji Manekji Patel	Olpad ..	Bhesan ..	3 March 1927 ..
17	Jamshedji Pestonji Manekshana ..	Bulsar ..	Dulsad ..	3 March 1927
18	Rustomji Manekji Patel	Olpad ..	Bhesan ..	22 March 1927..
19	Paragjibhai Parbhubhai	Jalalpore ..	Khadsupa ..	22 March 1927..
20	Nanabhai Naranji	Do. ..	Kanbad ..	28 March 1927..
21	Jamshedji Pestonji Manekshana ..	Bulsar ..	Dulsad ..	11 April 1927 ..
22	Bhavanbhai Gosaibhai	Jalalpore ..	Sisodra ..	24 April 1927 ..
23	Surat Arts College	Chorashi ..	Surat ..	30 April 1927 ..

Date of completion	Actual No. of working days	Total depth of boring	Diameter of bore	Water before boring in gallons per hour	Water level before boring	Water after boring in gallons per hour
6	7	8	9	10	11	12
		Feet	Inches		Feet	
20 August 1926.	5	50	6	500	24	1,500
1 November 1926.	3	28	4	1,000	47	3,000
3 December 1926.	11	48	4	....	....	500
3 December 1926.	13	63	6	500	22	700
16 January 1927.	33	117	4	1,000	20	1,000
18 December 1926.	7	31	6	500	28	1,500
28 February 1927.	59	161	4	1,000	22	1,000
22 December 1926.	4	20	4	500	21	1,500
7 January 1927.	13	50	6	500	21	1,500
24 January 1927.	24	85	4	1,500	21	1,500
23 January 1927.	8	57	6	500	20	1,500
31 January 1927.	4	30	4	500	40	1,500
25 February 1927.	21	43	6	....	16	....
26 March 1927.	34	194	4	500	27	740
21 March 1927	29	75	4 reduced to 3	1,500	40	1,500
13 March 1927	5	51	....	....	....	....
28 March 1927	17	54	6	2,000	18	2,000
30 March 1927	5	68	4	....	....	....
20 April 1927.	23	118	4½	1,500	40	1,500
3 May 1927 ..	25	91	4 3	250	7	250
27 April 1927.	11	53	6	2,000	18	2,000
5 May 1927 ..	6	45	4	1,000	65	2,000
30 May 1927..	15	72	4	....	....	....

No.	Name of the well or land owner	Water level after boring	Increase of water supply	Flat charges
1	2	13	14	15
	Surat District	Feet	Gallons	Rs. a. p.
1	Keshavram Ruderji	24	1,000	50 0 0
2	Daulatrai N. Desai	47	2,000	28 0 0
3	R. A. Smithwick	30' in tube well	500	48 0 0
4	Gulabbhai D. Desai	22	200	69 8 0
5	Ranchhodbhai Premabhai ..	15	....	....
6	Jinabhai Bhimbhai	28	1,000	31 0 0
7	Rustomji Manekji Patel	22	....	....
8	Manibhai Bhimbhai	21	1,000	20 0 0
9	Maganlal Gopalji	22	1,000	50 0 0
10	Manibhai Bhimbhai	21	....	....
11	Govind Hari Bhana	20	1,000	60 8 0
12	Paragjibhai Parbhubhai	31	1,000	30 0 0
13	Gopalji Mohanji	16	....	....
14	Nanabhai Naranji	27	240	....
15	Paragji Parbhubhai	40	....	....
16	Rustomji Manekji Patel	....	....	....
17	Jamshedji Pestonji Manekshana ..	18	....	....
18	Rustomji Manekji Patel	....	....	....
19	Paragjibhai Parbhubhai	40	....	....
20	Nanabhai Naranji	7	....	....
21	Jamshedji Pestonji Manekshana ..	18	....	....
22	Bhavanbhai Gosaibhai	60	1,000	45 0 0
23	Surat Arts College	....	....	....

Cost of pipes and shoes	Labour charges	Cost of fuel, lubricating oil, coal, etc.	Total cost	Cost per foot	Result
16	17	18	19	20	21
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
90 0 0	35 0 0	24 2 0	199 2 0	3 15 9	Successful.
69 0 0	20 0 0	8 14 0	125 14 0	4 7 11	Do.
99 0 0	50 0 0	21 4 0	218 4 0	4 8 9	Do.
....	35 0 0	51 14 0	156 6 0	2 7 9	Do.
158 10 0	165 0 0	22 8 0	346 2 0	2 15 4	Failure.
....	22 0 0	37 4 0	90 4 0	2 14 7	Successful.
139 0 0	192 0 0	80 0 0	411 0 0	2 8 10	Failure.
41 0 0	20 0 0	16 14 0	97 14 0	4 14 4	Successful.
..	31 0 0	45 4 0	126 4 0	2 8 5	Do.
45 8 0	24 0 0	32 2 0	101 10 0	2 14 5	Failure.
135 0 0	33 0 0	24 12 0	253 4 0	4 7 1	Successful.
52 14 0	33 12 0	24 12 0	141 6 0	4 11 5	Do.
....	75 0 0	60 0 0	135 0 0	3 2 3	Accident—Failure as tools remained in bore.
147 12 0	60 0 0	85 0 0	292 12 0	4 8 1	Failure—Water tapped but in very little quantity.
104 8 0	80 0 0	28 0 0	212 8 0	2 13 4	Failure—Pipe could not be lowered further due to hard rock.
....	25 0 0	9 10 0	34 10 0	0 10 10	Failure due to saltish water tapped.
16 0 0	75 0 0	45 0 0	136 0 0	2 8 3	Failure due to no work done further due to hard rock.
35 0 0	20 0 0	11 4 0	66 4 0	0 15 7	Failure as saltish water tapped.
79 0 0	65 0 0	28 0 0	172 0 0	1 7 4	Failure,
100 0 0	37 8 0	33 0 0	170 8 0	1 13 11	Failure as water did not flow from bore hole in well.
....	45 0 0	50 0 0	95 0 0	1 12 8	Failure as work could not be done due to hard rock.
96 2 0	35 0 0	12 12 0	188 14 0	4 3 2	Successful.
....	67 8 0	23 4 0	90 12 0	1 4 2	Failure—Water tapped but not good.

No.	Name of the well or land owner	Taluka	Village	Date of commencement
1	2	3	4	5
24	Nagar Vallabh	Bulsar ..	Abrama ..	2 May 1927 ..
25	Vora, Hussein Mahomed	Jalalpore ..	Nasilpore ..	11 May 1927 ..
26	Supa Gurukul	Bardoli ..	Supa	13 May 1927 ..
27	Govind Hari Bhana	Bulsar ..	Mogarawadi ..	29 May 1927 ..
28	Arts College, Surat ..	Chorashi ..	Surat	31 May 1927 ..
	Panch Mahals District			
1	Fakirbhai Lallubhai	Godhra ..	Shivpuri ..	14 December 1926.
2	Kachhia, Jethalal Jagjivan	Do.	Godhra	14 January 1927.
3	Parikh, Manekbai Dwarkadas ..	Do. ..	Do. ..	22 February 1927.
4	Manilal Chhaganlal	Do.	Do. ..	5 April 1927 ..
5	Patel, Jhaverbhai Ganesh	Halol ..	Arod ..	4 May 1927 ..

Date of completion	Actual number of working days	Total depth of boring	Diameter of bore	Water before boring in gallons per hour	Water level before boring	Water level after boring in gallons per hour
6	7	8	9	10	11	12
		Feet	Inches		Feet	
14 May 1927 ..	3	6	6	250	16	250
30 May 1927 ..	11	80	4	1,000	30	1,150
9 June 1927 ..	20	85	4½			500 in bore.
....	....	....	....	....	....	....
7 June 1927 ..	3	35	4	....	....	500
8 January 1927.	14	30	4	....	12	500
18 February 1927.	23	17	4	2,000	19	2,225
2 April 1927 ..	14	9	4	1,000	22	1,000
21 April 1927..	3	1	4	1,000	4	1,000
8 June 1927 ..	16	48	4	1,000	22	2,000

No.	Name of the well or land owner	Water level after boring	Increase of water supply	Flat charges
1	2	13	14	15
		Feet	Gallons	Rs. a. p.
24	Nagar Vallabh	16	....	....
25	Vora, Hussein Mahomed	27	150	....
26	Supa Gurukul	Water up to bottom of well in bore.	500	102 8 0
27	Govind Hari Bhana	....	....	....
28	Arts College, Surat	Water in bore ..	500	35 0 0
	Panch Mahals District			
1	Fakirbhai Lallubhai	12	500	30 0 0
2	Kachhia, Jethalal Jagjivan ..	19	225	17 0 0
3	Parikh, Manoklal Dwarkadas ..	22	....	....
4	Manilal Chhaganlal	4	....	....
5	Patel, Jhaverbhai Ganesh	22	1,000	48 0 0

Cost of pipes and shoes	Labour charges	Cost of fuel, lubricating oil, coal, etc.	Total cost	Cost per foot	Result
16	17	18	19	20	21
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
....	24 0 0	7 0 0	31 0 0	5 2 8	Failure as tool did not work due to hard rock.
82 10 0	42 0 0	32 0 0	156 10 0	1 15 2	Failure—Water tapped but in very little quantity.
118 12 0	72 0 0	29 0 0	322 4 0	3 12 8	Successful.
....	....	....	....	....	Incomplete.
57 12 0	25 0 0	7 4 0	125 0 0	3 9 2	Successful.
67 8 0	70 0 0	38 12 0	206 14 0	6 14 0	Successful.
12 4 0	75 0 0	50 4 0	154 8 0	9 1 5	Do.
....	50 0 0	27 8 0	77 8 0	8 9 9	Failure.
....	20 0 0	10 4 0	30 4 0	30 4 0	Do.
8 7 4	32 0 0	30 12 0	119 3 4	2 7 9	Successful.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat, Surat.

APPENDIX G

Summary of Work done under the Deputy Director of Agriculture, Konkan, during the year 1926-27

Staff.—Mr. V. G. Gokhale was in charge of the office of the Deputy Director of Agriculture till 25th March 1927 when he went on deputation to the Agricultural College, Poona, as Professor of Agriculture, and the writer took over the charge from him. The work described below was controlled and directed by him.

2. The superior subordinate staff consisted of 15 Graduate Assistants of which 9 were working in Research and Experiment and 6 for extension and propaganda in the districts and agricultural education. In addition to this the services of the Betta Overseer in Kanara District were made partly available for propaganda work in that district.

3. *Season.*—The monsoon commenced rather late—in the second week of June in North Konkan and first week in South Konkan. There was a pretty long break in the third and fourth weeks of June in North Konkan where the growing of rice seedlings were affected to a certain extent, but the timely rains in the beginning of July revived the seedlings and transplanting operations were finished by the middle of July. There were continuous and heavy rains throughout July and August which caused floods in Ratnagiri and Kanara districts, where crops were damaged on river banks. On the whole the rainfall of the year was above normal. However, the rice crop, which is the principal produce in Konkan, came out normally and in many places the crop was above normal. Mango crop was fairly good. There was no important pest which affected the crops during the year. The attack of koleroga disease on betelnut palms was mild.

4. The vegetable and other crops in the rabi season came out well but the prices in some cases were so low in Bombay that in several cases the produce had to be fed to cattle. The crops of ginger and betel-vine in north Thana were badly affected by the heavy and continous rains of the monsoon and the growers were put to loss.

Research and Experiment

(Rice Research)

5. *Karjat Station.*—The physiological factors which contribute towards making up the yield, and the best and most economic ways to influence their action have been under an intensive and exhaustive study at Karjat Rice Research Station for the last seven years. Most of the research work was based to determine ways which would increase the size of the ear head of the rice plant ultimately leading to a greater yield per acre with more economic advantages to the grower. Broadly speaking the results obtained so far may be summarised as under :—

(*a*) On the trap soils of Karjat, nitrogen in the form of ammonium sulphate at the rate of 60 lbs. per acre in three doses—30 lbs. after

transplanting, 15 lbs. before flowering and 15 lbs. at flowering,—gives larger ear-heads leading to greater yield per acre with economic benefits.

(*b*) The effect of phosphates and potash applied in addition to ammonium sulphate is negligible on the trap soils of Karjat.

(*c*) Organic nitrogen specifically produces larger ear-heads on an equal number of fertile tillers than nitrogen in the form of sulphate of ammonia.

(*d*) The nipping off of tillers to get an increased size of ear-head and thus proportionately more yield per acre has definitely failed.

(*e*) The natural recuperation of rice lands in the trap area which are generally not manured is evidently due to silt received from hill washes and floods.

6. *Studies in water requirements of the rice plant.*—These were continuous on this station and the results obtained indicate that rice plants are not much affected by about a week's break after a saturating shower under ordinary conditions. But when the soils are enriched by manuring such breaks cause appreciable reduction in yields.

The rice plant under the natural conditions of growth from sowing to harvesting in the North Konkan utilises water equal to about 25 inches of rainfall during the season excluding evaporation from the soil and the transpiration ratio may be put to about 600 when the crop is not manured while it is very much reduced when the crop is heavily manured.

7. *Kumta Farm.*—The soils of the Kumta Farm are of laterite origin representing a quite different set of conditions and climate from those at Karjat. The rice experimental work was continued in the past year to supplement the work at Karjat under these different conditions. The soils are distinctly acid representing varying degrees of drainage and water-logging. The results of the experiments during the year can be summarised as under :—

(*a*) Nitrogen in the form of ammonium sulphate increases the size of the ear-head and consequently increases the yield per acre as in the trap soils of Karjat.

(*b*) Under Kumta conditions most economic results are obtained when ammonium sulphate is given in conjunction with farm yard manure.

(*c*) Mineral phosphates give some positive results on laterite soils as compared with those on trap soils at Karjat.

(*d*) Lime is always beneficial except in well drained soils where probably the soils are less acid.

(*e*) Bone-meal gives excellent results in well drained springy soils. It is not effective in ill-drained soils.

8. *Rice Breeding and Selection.*—The rice breeding work was continued on the Ratnagiri Farm as in the past, and the year under report was the fourth year of the work. The comparative performance of most of the selections have stood a fair amount of consistency during the past

three years. Among the early group of rices, the strain No. 25 which is white grained and No. 42 which is red grained have given an increase of yield from 30 to 40 per cent. as compared with the local *patani* rice and it is proposed to try them on cultivators' fields next season.

9. The late group of rice strains was attacked by stem borer as in the past; but in spite of this some seven or eight strains have given constantly higher yields and of those strain No. 61 is the highest yielder giving 25 per cent. more yield per acre. Ratnagiri being unsuitable for these late strains it has been settled to try them next year in places from where they were originally selected.

10. Some of the late strains of rice which were susceptible to borer attack at Ratnagiri were tried on the Kumta Farm in comparison with the Kumta local. There was no borer attack at Kumta; but in many cases the strains did not prove appreciably superior to the local *Halga* variety.

Some strains of the early group were also tried at Kumta and amongst these, strain No. 41 gave higher yield as compared with the *muskati*. All these strains will be again tried next year at Kumta for further observations.

11. Strains selected for hereditary resistance to borer attack in the past two seasons were found not to be immune to such attacks during the year under report when the borer attack was more virulent. It has been arranged to collect rice varieties with a hard cuticle and slight leafiness with a view to observe their resistance against borer attack under Ratnagiri conditions in the next season, and if possible to use them for crossing with the local rices.

12. Karjat Kolamba No. 79 was again tested on the Ratnagiri Farm and it has maintained its superiority over the local for upland soils yielding about 15 per cent. more.

13. *Manurial Experiments on Rice.*—The American Cyanamid Company of New York supplied two grades of "ammos-phos" manure for trial on rice crop and the results obtained at different places show that it is as good as ammonium sulphate and can compete with it if it is cheaper. There was no material difference in the effect of the two grades.

14. On the Ratnagiri Farm bone-meal was tried on rice crop on upland and *mala* lands and the results obtained show an increase of 9 to 14 per cent. over the check plot. The experiments with wild indigo as green manure reported in paragraph 8 of last year's report, was again tried this year and the yield obtained by this treatment was 69 per cent. over the locally treated plot. It is quite clear that green manure is very effective on rice crop.

15. *Nagli Breeding and Selection.*—This work was continued at Hatkhamba Varkas Land Sub-station as in the past years. Two promising strains E 31 and E 82 were tested at 5 different plots under eight replications and they gave 43 and 30 per cent. increases respectively over the local. During the year under report, seed of these types was issued to the cultivators for trial in the different talukas of the Ratnagiri district, and

it has been reported that they have given very good results in Rajapur and Ratnagiri Talukas of the district, giving about 25 per cent. more yield over the local.

16. *Manurial Experiments on Nagli.*—On the coastal side of the Ratnagiri district it was common practice to apply fish manure to the *nagli* crop ; but in recent years the fish manure has gone very dear and cultivators are not in a position to make its use. With a view to see whether cheaper manures like ammonium sulphate and bone-meal can be profitably utilised as manure for nagli. These manures were tried at Hatkhamba in comparison with fish manure. The results obtained show that bone-meal is the most economical manure and gives a profit of about Rs. 20 more per acre than fish manure.

Experiments on Sugarcane at Kumta

17. *Manurial Experiments.*—Bone-meal applied at the rate of 200 lbs. per acre in addition to farm yard manure is very advantageous as compared to farm yard manure alone. Increasing the dose of bone-meal to 600 lbs. did not show any advantage. But the bone-meal has not been able to compete with ammonium sulphate which has given consistently better results.

18. *Spacing experiments.*—Sugarcane was planted at distances of $2\frac{1}{2}$, 3 and 4 feet and the results obtained during the past three years show that under Konkan conditions wider planting is not advantageous.

19. *Experiments on Cocoanuts.*—The manurial experiments described in paragraph 12 of last year's report were continued; but in order to reduce the cost of the mixture fish was eliminated and oil-cake was increased instead and the mixture used was 4 lbs. of bone-meal 4 lbs. of oil-cake, 1 lb. of potash sulphate and 1 lb. of common salt. The results obtained are as good as with the previous mixture and on an average it gave 50 per cent. more yield. One interesting point noticed in these experiments was that the manured plants produced 14 per cent. more female flowers than the unmanured and the proportion of ripe fruits borne to the number of female flowers was also greater in the case of manured plants than that in the case of unmanured plants—it being 50 per cent. in the former and 36 per cent. in the latter.

20. With a view whether the old cocoanut gardens can be renovated and made to pay better, the following simple treatments were tried in an old plantation:—

(*a*) Tying of cattle at different places in the garden in the fair weather, say, from January to May with a view to take advantage of cattle urine—the ordinary droppings being removed to the manure pit.

(*b*) Application of 2 lbs. of common salt to each tree.

(*c*) Digging of the soil in November. The observations of the past two years show that the plants have been more vigorous by these treatments ; but there is yet no material advantage in the produce of fruits.

21. In the course of observations on the cocoanut palm it was noticed that nearly 70 per cent. of immature buttons and nuts drop off; and this was found in all cases whether the plants were old or young, manured or unmanured. Further observations during the year showed that the dropped nuts were affected by a fungus called *diplodia*. The Plant Pathologist suggested spraying with Bordeaux mixture every fortnight after the opening of the spadix and this is under observation now.

22. *Experiments in Forest Growing.*—With a view to find some quick growing species with plenty of leaf which can be grown on the deforested areas so that the leaf manure be made easily available to cultivators, these experiments are being carried on for the last 5 years on a piece of forest land on the Kumta Farm. It was observed that under ordinary open natural conditions many of the species which were planted did not make satisfactory progress due to cattle grazing and poor nature of the soil. It was, therefore,decided during the year under report to try this experiment in a more controlled way, so that, the plants may get some good cultivation, and protection from cattle. Under these conditions a number of species were planted during the year and it is expected to obtain some promising results from these trials in the near future.

23. *Experiments in rotting of leaf Manures.*—Leaf-manure is the common fertiliser used in the Kanara district and leaf of some of the shrubs and trees used for this purpose does not decompose even in a year. In order, therefore, to quicken the rotting of this material a series of experiments were conducted in which ammonium sulphate and lime were used. The results obtained can be summarized as under:—

(*a*) ·3 per cent. of nitrogen in the form of ammonium sulphate and 5 per cent. of slaked lime decomposes ordinary dry leaf in three months' time to the consistency of well rotten farm yard manure.

(*b*) Very fibrous materials such as rice husk and sugarcane thrash require stronger solution of ammonium sulphate—the proportion necessary being 6 per cent. the weight of the material.

Crop Pests and Diseases

24. *Rice gall Midge* (*Pachy-diplosis Oryzea*).—This pest is found to cause damage upto 25 to 30 per cent. in the rice seedlings in the Kanara district. The observations made show that heavy early showers in the month of May forebode definitely the appearance of the pest. The precautions to be taken in such years are that the rice seedlings should be transplanted as early as possible. Further study on this pest is in progress.

25. *Rice Land Crabs.*—An extensive trial with two fumigants namely, carbon bisulphide and calcium cyanide was carried on during the year to eradicate the crabs in rice-lands. The operations were conducted in the month of September at Karjat on an area of 30 acres. Seventeen thousand four hundred and forty fi e holes were treated with carbon bisulphide at the rate of one dram per hole and 14,371 holes were treated with calcium cyanide at the rate of $\frac{1}{6}$ oz. per hole. In the former

case 535 holes or 3 per cent. were opened in a week and in the latter 1,246 or about 9 per cent. for the same period. The efficacy of these measures can be judged from their effect in the coming season which will be duly observed. However, one great drawback of the results was that the cost per acre was rather prohibitive amounting to more than Rs. 10 per acre, and it is arranged to plan the operations in the coming season in such a way that the cost may be reduced to the minimum.

26. *Garden crop pests.*—The Entomological Assistant was posted at Palghar in the fair season to study and suggest practical measures for pests in garden crops which are very important in the North Thana tract. During the year he made observations on all the important pests which affect the garden crops. This year the only important pests were thrips on onions and bugs on betelvines both of which were successfully controlled by spraying with tobacco decoction and fish oil rosin soap emulsion.

27. *Onion leaf blight.*—This pest has been found very destructive to the recently introduced crop of onion in the Kanara district. As was noticed in the past the blight follows the attack by thrips. This year measures were taken to control thrips by spraying with kerosine and other emulsions; but the blight disease was not controlled by these operations. Further study is in progress and new varieties are being tried to see whether some type can be found which may be blight resistant.

28. *Mango flower blight.*—This is the second year of the investigations carried on this disease. The observations made during the year show that mango flower blight is partly caused by hoppers and mildew; but there are other factors which cause the blighting of a considerably large number of flowers which are still unknown. Spraying with one half per cent. fish oil soap emulsion against hoppers gave satisfactory results. The increase in the number of fruits being 14 to 32 per cent. as compared with untreated trees. Sulphur dusting and spraying with Bordeaux mixture were also found useful against mildew and gave more number of fruits varying from 10 to 40 per cent. Study of the mango flower heads is under progress and it is expected to obtain very interesting results in course of time.

Propaganda

29. *Propaganda.*—The principal items of the programme of the district staff were as under :—

(1) *Introduction of improved and high yielding rices.*—As in the past years the operations for the distribution of *kolamba* No. 42 were principally carried on in the Kolaba and south Thana tracts. During the year 80 *khandies* of this seed sufficient to sow 3,200 acres was distributed. The seed is appreciated and it is getting popular; but the socio-economic conditions prevailing in this tract are such that the cultivators who are mostly tenants of large land-holders, have no cash money to purchase the seed at the sowing time and the land-lords—mostly absentee—are not much interested except in the collection of rents.

Under the circumstances credit sales have to be resorted to. So far this is working fairly well, but the energy of the staff is chiefly to be devoted to this work for collections, etc.

Kolamba No. 79 has been found very suitable for high lying lands in the north Thana and Ratnagiri districts; and during the year, seed sufficient for 200 acres was distributed.

Maskati and Halga varieties of rice.—These rices are getting popular in the Kanara district and arrangements were made to supply seed sufficient for 250 acres.

In north Thana where very fine rices are grown two strains from Karjat Nos. 35 and 226 were tried during the year and it was observed that they would be suitable for this tract. Further trials are arranged in the coming seasons.

(2) *Improved nagli strains.*—Two of the strains Nos. E-31 and E-82 evolved at the Hatkhamba Sub-station were distributed in all districts this year; but so far they were found useful only in the Ratnagiri district, where in Rajapur taluka it has given very good results. Arrangements have been made for further trials in the coming season.

(3) *Introduction of other new crops and varieties.—Red Mauritius* variety of sugarcane is steadily gaining ground in the Kanara district and some more varieties recently introduced there, such as *manjav, burbadose,* etc. are finding favour in low lying areas. Sugarcane which was newly introduced in the Ratnagiri district is not making much headway and the area has been reduced from 40 to 20 acres. This is chiefly due to the low prices of gul prevailing at present and damage by pigs. Onion crop in the Ratnagiri district is getting popular and during the year it was grown in 50 different villages. Besides these sweet potatoes, groundnuts, tapioca and such other crops which were found suitable after trials are being popularised and all efforts are made to expand them where they are found profitable.

(4) *Manure distribution.*—The use of ammonium sulphate as a partial substitute for *rab* is gaining ground and its usefulness as manure for rice and garden crops was demonstrated in all the districts. It is gratifying to note that in some places private persons have taken to this trade. In all nearly 40 tons of this manure was supplied to cultivators both through Departmental and private agency. Similarly bonemeal and phospahte were distributed to the extent of nearly 12 tons mostly for fruit trees in Ratnagiri district and for rice in Kanara district. Blood manure from Bandra slaughter house was demonstrated on the garden crops in Bassein and nearly 3 tons of it was supplied to different cultivators.

(5) *Implements and Machinery.*—Among implements the iron cane crushers and Poona gul-boiling pans are now fastly spreading in the Kanara district and during the year the Department made arrangements to supply 20 crushers and 40 boiling pans. The wooden Persian wheel has begun to replace the local "*Dotte*" in the Kanara district and 12 Persian wheels and 5 *Bulsar Rahats* were erected there during the

year. In north Thana where garden cultivation is expanding new labour saving implements such as Macormic cultivators, tooth harrows, etc., were extensively demonstrated and arrangements were made to supply them wherever there was demand. In the Ratnagiri district, Meston ploughs and Deccan harrows are slowly getting ground and during the year 50 Meston ploughs and 5 Deccan harrows were distributed.

In north Thana 8 power pumping plants were installed during the year and the Agricultural Department gave advice and suggestions whenever called for.

(6) *Horticultural operations.*—Fruit cultivation is expanding in almost all districts; but new developments are taking place specially in north Thana and Kanara districts. Santra, chikoo and mango grafts numbering about 900 were distributed in these areas and the staff gave all possible help and advice in establishing new plantations.

(7) *Koleroga Spraying.*—During the year 175 sprayers were in use in the Siddhapur and Honawar talukas of the Kanara district, and 200 acres of betelnut gardens were sprayed. Extensive propaganda and demonstration were arranged and for the coming season 40 dozen more sprayers were obtained. The farmers themselves are not doing this work; but they depend upon outside labour for it, which is very difficult to procure at the proper time of spraying; hence the work is bound to be slow for some years till local men become available for the work. In the Dapoli taluka of the Ratnagiri district, where there is some betelnut cultivation, *koleroga* spraying was demonstrated and there was demand for sprayers and spraying materials which were met with by the local Taluka Development Association with the help of the District Agricultural Overseer.

(8) *Breeding bulls.*—Three Surti buffalo bulls were maintained during the year at Ratnagiri, Hatkhamba and Kumta and in all 210 buffaloes were covered during this period. It is reported that some of the progeny by these bulls have calved and they are found to be good milkers.

At the request of the Kumta people the Director of Agriculture was kind enough to supply a Sindhi Bull from the Poona College Dairy on the Kumta Farm for breeding purposes; but unfortunately the bull being too big for the local cows, its advantage is not being taken by the people, and if on further inquiry it will be found that it will not serve any useful purpose there, arrangements will be made to shift it to some other place where it can be of better use.

(9) *Denaturalised salt.*—During the year licences for 5,049 maunds of this material were issued as against 3,726 maunds in the past year. This arrangement has proved very useful and people are now taking to its use freely.

(10) *Crop-tests.*—The propaganda staff and other Graduate Assistants took 12 crop tests on rice, *nagli*, and sugarcane during the year as per G.R. No. 601 dated 21st January 1914.

(11) *Poona Agricultural Show.*—The staff of the division did very useful work in connection with this Show and made all possible attempts

to collect exhibits and make the show popular. Five hundred and fifty exhibits were collected and 30 prizes worth Rs. 140-8-0 and 18 medals (3 gold medals, 1 silver and 14 bronze) were obtained by the exhibitors from this Division.

(12) *Demonstrations.*—In order to bring home to the cultivators the various agricultural improvements and new introductions, the propaganda staff arranged in all 608 demonstration plots on cultivators' fields and at some of the important centres large numbers of cultivators were collected together from the surrounding villages to show them the actual results obtained.

Besides these field demonstrations, the propaganda staff arranged magic lantern shows and lectures in their tours in villages and every effort was made to popularize the agricultural improvements advocated by the Department.

(13) *Publications.*—The monthly magazine in Marathi namely "Konkan Sheti Samachar" continued to be published during the year by Mr. Limaye, Proprietor of "Satya-Shodhak" and the staff of the Division contributed regularly to this magazine. During the year the editorial work of this magazine was carried on by Mr. M. V. Gadkari of the Rice Research Station, Karjat. They all deserve the best thanks for the conduct and upkeep of the magazine.

The following leaflets were published during the year.—

(1) Remedies for Koleroga Disease of Betelnuts (Leaflet No. 13 of 1926).

(2) Tapioca cultivation in Kanara (Leaflet No. 12 of 1926).

(3) List of implements recommended by the Department for Konkan Division (Ratnagiri, Kolaba, Thana and Kanara) (Leaflet No. 2 of 1927).

(4) Koleroga Wall Calendar.

Besides this, the staff contributed notes and articles to the local press and other agricultural magazines. In all 95 articles were contributed during the year and it is gratifying to note the interest shown by all of them in the publicity matters.

(14) *Coordination of Revenue and Agricultural Departmental Staff for Agricultural propaganda.*—During the year 4 Coordination Meetings were arranged at Ratnagiri, Thana, Kolaba, and Kanara under the Presidentship of the Collector of the district at which the members of the District Local Boards were invited. The Deputy Director of Agriculture presented and discussed the programme of work for each district and the members were requested to assist the Department in carrying it out. It is gratifying to note that as a result of these meetings several Revenue Officers have taken keen interest in the work of the Department and at suitable places Taluka Development Associations are being organised by them to spread agricultural improvements. The District Propaganda Staff met all the Mamlatdars in their respective districts and laid down simple schemes of agricultural demonstrations for

the different talukas. Several of the Mamlatdars took keen interest in the work and I must specially mention the name of Mr. S. R. Kulkarni, late Mamlatdar of Siddapur, who took particular interest in the Agricultural Development of that taluka.

Organisation

30. *Divisional Board of Agriculture.*—During the year there were four meetings of the Board, at one of the which the Deputy Director of Agriculture was the Chairman and at the other three, the Assistant Registrar, Co-operative Societies, Bombay Division, presided. It controlled and directed the work of the propaganda staff of the Agricultural and Co-operative Departments and the Taluka Development Associations as usual.

31. *Taluka Development Associations.*—There were 9 registered Associations during the year as under :—

Thana district.—Mahim, Kalyan and Umbergaon.

Kolaba district.—Alibag.

Ratnagiri district.—Ratnagiri, Dapoli and Rajapur.

Kanara district.—Karwar and Sirsi.

Of these, the Association at Alibag ceased to function during the year for want of funds and local enthusiasm. Efforts were made to put it on a working basis but so far the attempts have failed.

Unfortunately few of the Associations have got permanent funds on which they can rely for steady income; and their dependence on yearly collections from members, makes their stability very precarious. In most cases they have to depend upon the assistance of local Revenue Officers for collection of funds and when such assistance is indifferent, the collections dwindle down. However, it is gratifying to note that the Revenue Officers are now taking keen interest, and many of the Associations have put forth very useful work during the year. The technical work of the Associations was guided by the propaganda staff and some of them served very useful purpose by way of distributing seeds, manures, and implements in their respective areas. Specially the work of the Mahim, Ratnagiri and Rajapur Associations was very commendable which were ably guided by the District Agricultural Overseers in charge of the respective districts.

The District Agricultural Overseer, Kolaba, organised three new Taluka Development Associations during the year at Pen, Panwel and Roha in the Kolaba district with the help of the local Revenue Officers and the proposals are before the Registrar, Co-operative Societies, for final disposal. The District Agricultural Overseer, North Thana, has prepared grounds for starting an Association at Dahanu and it is expected to take shape in near future. Proposals for two more associations at Malvan and Chiplun in the Ratnagiri district have been sent by the Mamlatdars of these talukas and they are under consideration of the Divisional Board.

32. *Non-credit co-operative work.*—There are 23 non-credit societies during the year of which 3 were organised in the year under report. The newly organised societies were as under :—

1. Siddapur Agricultural Requisite Supply Society.
2. Palghar Paddy Sale Society.
3. Karjat Paddy Sale Society.

The first was organised by the District Agricultural Overseer, Kanara and the remaining by the Agricultural Organiser, Co-operative Societies, Palghar. On the whole the work of the non-credit societies cannot be said to be satisfactory, except a few exceptions. The Manure Societies in Mahim and Bassein Talukas were unable to recover debts from the members and the Assistant Registrar has stopped their credit and efforts are being made to reconstruct them. The Mango Sale Society at Ratnagiri did not do any regular business, but it is more or less now doing the propaganda work in matters of mango marketting.

33. *Utilization of Grain Depôts in Dahanu Taluka of the Thana District for seed distribution.*—There are 5 grain banks managed by the Revenue Department in Dahanu taluka in the forest area and the Collector of Thana District has kindly allowed them to be utilised for purposes of seed distribution in that area. Improved rice seed will be issued from these depôts to the cultivators and the Agricultural Department will replenish the seed every year by supplying pure seed for distribution. It will be interesting to watch the results of this arrangement and its influence on the quality of the produce.

Agricultural Education

34. *Vernacular Agricultural School at Jambul.*—This school continued to work as in the past. There were 13 students in the first year and 9 in the second. Three primary school teachers, one each from Kolaba, Thana and Ratnagiri received their training at the school to serve as teachers for agricultural bias schools. The result of the annual examination held in April 1927 was as under :—

Class	No. of boys who appeared at the examination	No. of boys who passed in the examination
1st year	13	11
2nd year	9	7
Primary teachers	3	2

Out of 73 boys turned out successful from the School till now, 49 are engaged in agricultural pursuits, 16 are in service connected with agriculture and the rest in other business.

The total expenditure of the school including the teaching staff and boarding expenses amounted to Rs. 11,874 as against Rs. 11,755 last year. The total receipts were Rs. 1,771 as against Rs. 1,983 of the preceding year.

35. *Agricultural Bias Schools.*—There were six bias schools in this division—two each in Ratnagiri and Kanara and one each in Thana and Kolaba districts. These schools are controlled by the Education Department but the Agricultural Officers visited all of them and gave every possible help and advice in agricultural matters connected with these institutions. They all conducted the annual examinations in the agricultural subjects. In many places there is some opposition to these schools from the local public; but if the teachers are tactful and persevering the opposition will break down. The villagers prefer English classes to these schools so that their boys may get English education with a view to getting Government service. If the curriculum is arranged in such a way that the boys attending these classes can also learn English, the schools will be more popular.

36. *Boring.*—There were seven machines in the division. One of which is Calyx Drill and the rest Musto Patent Machines. During the year the four remaining Musto Patent Machines were converted into power machines; so all the machines in this Division are now power worked machines. The total amount of footage bored during the year was 1,972 feet as against 2,200 feet last year. The total number of bores made was 31 out of which 16 were successful, 7 unsuccessful, 7 incomplete and in one there was brakish water. The outturn of work is comparatively poor and the main causes for this were as under:—

(1) The dilapidated condition of the Calyx Machine.

(2) Times spent in conversion of 4 Musto Patent Machines.

(3) Want of trained mechanics to work the converted power machines.

(4) Want of proper equipment; for power machines.

(5) Want of transport facilities in Ratnagiri and Kanara districts, cause a great delay in shifting machines from one place to another.

These difficulties are yet not fully met with due to want of sufficient funds; but it is hoped the machines will be well equipped in due course of time.

The statement of detailed information regarding boring work prescribed in Government Resolution No. 7075, R.D., dated 5th May 1923, is appended separately.

37. *Personnel.*—The staff worked efficiently to the best of their abilities and put in good work during the year. Special mention should be made of Messrs. Wagle and Modi, the former for his keen enthusiasm in research work entrusted to him and the latter for organisation of agricultural propaganda in a popular way in the Thana district where he is working. There was no important change except that Mr. G. C. A'more took charge as Boring Assistant in September 1926 and Mr. Limaye reverted as second clerk in the office of the Deputy Director of Agriculture, Konkan Division.

C. S. PATEL,

Deputy Director of Agriculture,
Konkan Division, Ratnagiri.

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore	Water before boring in gallons per hour	Water after boring in gallons per hour
	Machine No. 2			Inches	Ft. in.		
1	Mr. K. M. Shroff ..	Palghar ..	Palghar ..	5	130 0	Surface	500
2	Village Panchayat ..	Do. ..	Do. ..	5	60 0	Do. ..	
3	Mr. Deoji Mohomad ..	Do. ..	Do. ..	5	58 6	Do. ..	
4	Gorakshak Mandali ..	Salsettee ..	Kandivli ..	5	50 0	Do. ..	
	Machine No. 16						
5	Mr. Cowasji Palanji ..	Dahanu ..	Waghmare .	4	130 0	1,500	2,500
6	Mr. Borjarji C. Patil ..	Do. ..	Gholwad ..	4	101 0	Well dry.	1,000
7	Mr. Byram Zack ..	Do. ..	Do. ..	4	70 0		Water
8	Mr. Ardesar K. Irani ..	Do. ..	Do. ..	4	100 0	1,000	2,000
9	Mr. Bamanji Irani ..	Do. ..	Do. ..	4	60 0	1,000	2,500
10	Mr. Furdum K. Irani ..	Do. ..	Do. ..	4	125 0	2,600	3,600
11	Mr. Mancharsha A. Deheriwalla. ..	Umbergaon .	Kawad ..	4	127 0	2,000	3,500
12	Mr. Dhunbhai Pestanji ..	Dahanu ..	Gholwad ..	4	62 0	1,500	2,500
13	Dr. M. J. Mistry ..	Do. ..	Dahanu ..	4	44 0	Dry.	1,000
14	Mr. Hormasji J. Patel ..	Do. ..	Deheri ..	4	51 0	2,500	3,500
15	Mr. Hormasji J. Patel ..	Do. ..	Do. ..	4	95 0	3,500	7,000
	Machine No. 46						
16	Church of Brethren Mission.	Palghar ..	Palghar ..	4	102 0	Surface	1,500
17	Mr. G. L. Joshi ..	Do. ..	Kelwa ..	4	101 0	Water not tapped	
18	Mr. B. A. Dandekar ..	Do. ..	Nandgaon ..	4	104 6	1,000	2,500
19	Mr. Bhaskar Deoji Vartak	Do. ..	Mahim ..	4	56 6	1,000	2,500
20	Bala Jagu Vartak ..	Do. ..	Do. ..	4	39 0	In progress.	
	Machine No. 15						
21	Mr. N. B. Dandekar ..	Salsettee ..	Borivli ..	3	16 0	Abandoned	
22	Do. ..	Do. ..	Do. ..	4	14 9		Do.
23	Do. ..	Do. ..	Do. ..	4	45 0	In progress.	

Division during the year 1926-27 ending 30th June 1927

Departmental charges	Labour charges, etc.	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
240 9 0	288 0 0	528 9 0	4 1 0	Successful.	This machine was being overhauled during the months of July, August, September 1926 and then the high speed of the Engine coupled with rickety condition of parts working in hard trap rock resulted in the poor output.
Incomplete				Incomplete.	
Do.				Do.	
In progress				In hand.	
190 0 0	98 8 0	288 8 0	2 3 6	Successful.	This machine having its work more or less concentrated has given us very good results.
153 4 0	37 0 0	190 4 0	1 14 1	Do.	
tapped is saltish.			Water tapped is brackish		The rock in this area is soft and water is usually tapped at a depth of 50'-100'. The only difficulty being that in certain tracts saltish water is tapped which cannot be utilized for irrigation. This brackish water prevents people from taking deeper bores.
175 7 0	131 0 0	306 7 0	3 1 0	Successful.	
67 8 0	59 8 0	127 0 0	2 1 10	Do.	
168 8 0	166 0 0	334 8 0	2 10 10	Do.	
184 4 0	268 0 0	452 4 0	3 9 0	Do.	
80 8 0	59 8 0	140 0 0	2 4 1	Do.	
50 0 0	12 0 0	62 0 0	1 6 6	Do.	
55 10 0	59 14 0	115 8 0	2 4 3	Do.	
132 8 0	62 8 0	198 0 0	2 1 4	Do.	
210 12 0	150 0 0	360 12 0	3 8 7	Successful.	The working of this machine has been greatly hindered having met with various difficulties at the Mission bore. Moreover breakage of counter shafts, wearing out of tools, etc., has generally tended to give the poor results.
193 5 4	227 8 0	420 13 4	4 2 8	Abandoned at owner's request.	
140 4 0	236 0 0	376 4 0	3 9 7	Successful.	
68 8 0	131 0 0	199 8 0	2 10 4	Do.	
In progress.				Incomplete.	
bore having gone eccentric.				Abandoned.	Two bores taken have gone eccentric, having met with a soft strata at the commencement. The third bore is in progress. Rock now met is very hard. Trap-machine was converted into power plant in November 1926.
do.				Do.	
				In progress.	

Serial No.	Name of the land owner	Taluka	Village	Diameter of bore	Depth of bore		Water before boring in gallons per hour	Water after boring in gallons per hour
	Machine No. 6			Inches	Ft.	In.		
24	Mr. G. B. Raje ..	Pen ..	Pen ..	3	35	0	Surface	250
25	Mr. N. M. Dharkar ..	Do. ..	Uched ..	3	50	0	Tool jammed;	
26	Do. ..	Do. ..	Do. ..	4	9	6	In hand.	
	Machine No. 20							
27	Mr. V. A. Bhave ..	Sangmeshwar.	Kalambushi.	3	31	4	Incomplete.	
28	Ratnagiri Jail ..	Ratnagiri ..	Ratnagiri ..	3	34	0	Abandoned	
29	Mr. S. V. Deshpande ..	Dapoli ..	Dapoli ..	3	25	0	Well dry	500
	Machine No. 21							
30	Executive Engineer ..	Honawar ..	Honawar ..	3	91	0	Dry well	No trial was taken
31	Do. ..	Karwar ..	Karwar ..	4	70	3	Surface	10

Departmental charges	Labour charges, etc.	Total cost of boring	Cost per foot	Result successful or unsuccessful	General Remarks	
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.			
48 9 0	146 0 0	194 9 0	5 8 8	Successful .	This machine was converted into power plant in December 1926 and has given us faulty work since, due to faulty tools, etc.	
hence abandoned.				Abandoned.		
				In hand.		
owing to tool being jammed.				Incomplete .	This machine was also converted during March 1927 and no work could be undertaken before the period as the mechanic was deputed to work for the Ratnagiri Works.	
28 0 0	66 0 0	94 0 0	3 12 2	Successful.		
187 2 0	447 0 0	634 2 0	6 15 6	Abandoned at owner's request.	The conversion of the machine was completed in January and February 1927. The nature of rock prevents better footage, etc.	
				Do.		
160 12 0	589 13 0	750 9 0	13 0 4			

APPENDIX H

Summary of work done under the Deputy Director of Agriculture, Sind, Karachi, for the year 1926-27

Introductory.—It is a happy sign of the times that the public have begun to show an increasing amount of interest in the agricultural industry of the country. This interest has been stimulated by the huge irrigation works, *viz.*, the Lloyd Barrage and Canal Scheme which is under construction for the last two years. Hence the desire by the public as well as by the Press for agricultural reports and literature is growing very large. This desire is being satisfied as far as possible by the periodical issue of literature as well as by ocular demonstrations of the methods recommended by the Department.

A summary of these together with the research and investigation work carried on by the Department will be found in the following pages.

Prospective work with special reference to conditions which will prevail when the Barrage will be in working order is being carried out at a newly started station at Sakrand in Nawabshah District and will be reviewed separately in due course by the Director of that Institution.

2. *Organization and Finance.*—I continued to be in charge of the Division throughout the year.

In the Provincial Agricultural Service the Cotton Breeder 's post which lay vacant from March 1926 was filled by the appointment of Mr. Bapubhai B. Desai from 15th June 1927.

In the same service Mr. Jafferali Ansari vacated the Divisional Superintendent of Agriculture's post on 12th April 1927 on reversion.

Mr. Mahomed Umarkhan Barakzai was appointed as Superintendent, Fruit Farm, Mirpurkhas, on a pay of Rs. 250-20-500 and resumed his duties as such from 15th November 1926.

The administrative control of the Willingdon Cattle Farm near Malir (Karachi) together with the Landhi Substation hitherto with the Live-Stock Expert (Mr. E. J. Bruen) was transferred to me from 1st April 1927.

3. The total expenditure of the Division amounted to Rs. 1,55,908 as against Rs. 1,57,921 of the previous year.

The cash receipts during the year amounted to Rs. 47,020 as against Rs. 51,595 of the previous year.

Season

The main factor in the agricultural season of this Province is the river inundation. At the outset it caused grave anxiety as the gauges at Bukkur and Kotri registered readings much lower than normal inundation level. This not only brought out a reduction in the area of Kharif crops of rice but was responsible for a distinct set back to cotton acreage,

These crops were however replaced by jowar and bajri to an appreciable extent. It was only in the end of June that the river attained its normal level and thence forward continued to rise gradually and steadily and maintained good irrigation level till the close of the season.

5. *Rainfall.*—This is usually insignificant in this Province but monsoon falls of the year although late (July and August) were more than normal in both Upper and Lower Sind.

6. *Crops Pests and Diseases.*—The most peculiar feature of the season was the wide spread and frequent visitation of locusts throughout the Province damaging cotton and wheat.

7. *Temperature.*—Temperature ranged between normal limits except in Upper Sind where heat wave of severe intensity lasting for a week or so passed over parts of Sukkur and Upper Sind Frontier Districts. Similarly a wave of freezing cold occurred which considerably damaged potatoes and other cold weather crops.

8. *Prices.*—Depression in local cotton industry and excessive American harvest virtually brought down the cotton prices of both Desi and Sind-American which touched the lowest figure on record for the last decade, *viz.*, Rs. 7 to 8 per maund of seed cotton. Increase in the acreage of Rabi crops had an effect of easing the market of wheat, gram and oil seeds, but ill-effects of the frost considerably marred the outturn expectations.

9. *General.*—All things taken together, the year can not be said to be one of the average prosperity for the agriculturist and this was specially the case in Mid and Lower Sind.

Research and Investigation

10. This work is being carried out on a number of local crops of economic value with the object of improving them as also on foreign crops considerably superior to the local ones with the idea of acclimatizing and introducing them in the country. The extent to which the Department has succeeded in achieving this object is summarized below.

11. *Cotton.*—The varieties handled on large scale under this head are two—the short stapled cotton and the medium stapled cotton. The example of the first is the Sind local cotton and of the second the American types. Improvement in the case of Sind desi cotton has taken the form of isolating a strain which is not only high yielding but has a ginning outturn of about 39 per cent. as against 33 of the ordinary local. An organization of the pure seed supply of this is now sufficiently developed to admit of issuing every year seed sufficient for 6,000 acres for further multiplication on private holdings up to two generations more, when the seed reaches a quantity sufficient to cover fifty thousand acres or more.

12. Under this organization the Seed Farm, Mirpurkhas, cultivated during the year under review an area of 7 acres 12 gunthas (1 acre 20 gunthas under seed patch, etc., and 5-32 as increase block) and allotted

15 acres to field scale plantings. The total yield from the latter area amounted to 6,067 lbs. of seed cotton. This yield is poor when viewed from the standard adopted by the Department for judging a normal outturn of the cotton crop; but the late sowings due to deficiency of water on account of late inundation, and the harm done by the heavy deluge of rain which fell in a short period of two days, the locust attack and the severe frost, all contributed to bring about this reduced yield.

Ginning outturn as recorded was 37·75 as against 38·1 of the last year.

13. With regard to medium stapled cottons of which we have three types, *viz.*, 4F, 285F & 289F, 4F continues to maintain its superiority over others. The area put under this cotton on the Seed Farm amounted to 25 acres 32 gunthas and the outturn amounted to 16,504 lbs. or 640 lbs. per acre. This is a satisfactory outturn figure looking to the nature of the season. The only advantage that this cotton had, was that it was about 4 weeks earlier than 27 W.N.

Ginning percentage of 4F as recorded was 32·7.

14. Long stapled exotic cottons mentioned under paragraph 15 of last year's report together with the cotton crosses have been transferred to Sakrand for further trial and study.

15. *Wheat Improvement.*—Work on this crop has been in progress for some years and may be divided into the following two groups :—

(I) Improvement of local Sind varieties.

(II) Introduction of varieties of high fame from other parts of India.

The examples of (I) are the strains A.T. 38 and Cph. 47 selected from the ordinary local Thori and Phundani wheats and of (II) are Pusa 12 and Punjab 11 wheats.

In North Sind, which has by far the largest area under wheat cultivation annually, strains A.T. 38, Cph. 47 and Pusa 12 have proved satisfactory.

16. The detailed work carried out on this crop on our Farms at Larkana and Jacobabad during the year under report was as under :—

(*a*) Maintenance and multiplication of Pusa 12 and the two selected strains of Sind wheats (A.T. 38 and Cph. 47).

(*b*) Testing the suitability of Pusa 12, Cph. 47 and A.T. 38 under Bosi conditions.

(*c*) Fresh selections from private wheat fields.

Results of tests now extending over 3 years show that Pusa 12 is an early ripener and has a quality of grain which commands a premium in the market. It does well under both irrigated and Bosi conditions. Strain A.T. 38 (Thori) is a high yielding wheat but is of slightly lower quality. Hence both of these are well worth multiplying as rapidly as possible.

17. A fairly large quantity of pure Pusa 12 wheat is grown every year on the Wheat Farm, Jacobabad, and also on the Larkana Farm and is issued for multiplication to private seed growers. In the year under report the area and the outturn of Bosi wheat on the Wheat Farm, Jacobabad, was as under :—

Variety	Area in acres	Outturn in lbs.	Average yield per acre
Pusa 12 ..	73--3	59,026	809
Cph. 47 ..	10–37	7,252	659
A.T. 38 ..	7–37	8,322	1,040

On the Larkana Farm where the Rabi irrigation water is available the outturn was-as under :—

Variety	Total outturn in lbs.	Yield per acre
Pusa 12 ..	2,090	1,128
A.T. 38 ..	1,956	1,420
Cph. 47 ..	2,935	1,236

The above quantities will as usual be distributed among the seed growers for further multiplication.

18. Position with regard to seed multiplication of Pusa 12 by private zamindars in North Sind is that over 15,000 acres are reported to be cultivated with this seed and that the area is on the increase every year.

19. To further increase the rapidity of multiplication it has been decided to increase the number of selfed plants from 20 to 200 from the ensuing Rabi. This would enable 10 times the area to be put out in the second generation. Fresh seed selections are in the process of purification.

20. *Rice Improvements.*—Work on rice is conducted on the Larkana Farm and is in the form of improving by selection the marginally noted representative varieties and testing a number of foreign varieties with a view to introducing, if practicable, the most promising ones ; as also to make crosses between the best, local and foreign types to produce hybrids which should have all the market qualities, high prolificness and earliness.

Kangani
Jajai Sugdasi
Prong Sugdasi

Of the several strains of each of above three varieties of Larkana rice isolated some time ago, only the following have now been finally fixed as the most suitable :—

Kangani 27
Jajai 77
Prong 36

21. In the present season 19,317 lbs. of Farm grown seed of these strains as noted in the margin have been distributed, chiefly through Seed Societies under a guarantee to return the seed if required. This is enough for 500 acres, and this is the quantity that the Larkana Farm will normally provide.

Kangani 27..12,269
Prong 36.. 3,436
Jajai 77.. 3,612

In addition to the above, 16,220 lbs. of seed multiplied on private holdings have also been sold to seed sale societies for further distribution.

22. From among the trials of several varieties of foreign rice and their comparison with our selected strains, Assam type as well as Japanese, Central Provinces and Bengal ones (including Dadkani) have been finally rejected as being either abnormally late or inferior. Kolumba 241 from Konkan however continues to show promise having given an increase of 15·3 over Jajai 77 this year and over Kangani in 1925. The local demand for this strain (Kolumba 241) however is limited being unsuitable for par-boiling.

Further trials with Bengalo and Bara rice from Peshawar are being continued.

23. In the test of earliest varieties Sighro and Red Kangro preserved this character. The yield is small but the quality is good. These are being maintained for future breeding.

24. With regard to crosses of Kangani 27 and Kolumba 184 and 128 and of Kangani 27 and Dadkani made in 1926 with the object of obtaining a large number of grains per earhead, these will be sown and the character of first generation noted from plant to plant.

Further work in this line will take the form of attempting crosses between Torh and Kangani 27 with the object of selecting a rice with Kangani characters from the progeny, with the high tillering habit of Torh.

25. Regarding the work of developing pure types in several rices for special characters carried out in the year under review only the following have been retained as suitable for further observation and study :—

(*a*) *Earliness.*—Red Kango, Sighro.
(*b*) *High tillering.*—Torh, Tipidumia.
(*c*) *High number of grains.*—Kolumba 184.
(*d*) *Fineness of grain.*—Basant Bahar.
(*e*) *Weight of grain.*—New type Y.
(*f*) *Quality of grain.*—Bara Rice.

26. Commerical opinion with regard to the market and possibilities of our strains of the 3 important varieties of Larkana as well as Bengalo, Kolumba strains 184 and 241 obtained during the year do not show encouraging result—the premium offered being only from 2 to 8 annas per maund of 82 lbs. over the local material.

27. In the matter of hulling tests conducted on a small scale the strains have given a higher percentage of clean rice than the local paddies as under :—

Variety	Increase per cent. of clean rice from strain over that from local
Kangani 27	3·5 per cent.
Prong 36	17·1 ,,
Jajai 77	13·9 ,,

28. Regarding the question of sterility in rices which in some years reaches an appalling proportion, the disease is under investigation by Dr. Uppal—the Plant Pathologist. Experiments to see the effect of certain treatments suggested by him will be undertaken shortly. In the meantime a close observation will be done on earheads when they first appear with a view to getting some results.

29. *Jowar Improvement.*—The most striking feature of the twelve types grown at Larkana since 1921 with open earheads, was their purity in the characters under examination. It would seem —

(1) that uniform seed of this kind which will breed true is a most valuable material;

(2) that it is also most valuable that in these types, apparently plants can be grown with open earheads in Upper Sind and remain almost if not entirely pure;

(3) that multiplication of the most useful of these types, *viz.*, Alakh, Baghdar, Saoro Kartuho and Janapur red, can now be made for distribution.

The only doubt about the whole is that of the true yielding capacity of the types.

30. One thousand lbs. of Alakh have already been given out in Upper Sind for seed multiplication, while the seeds of the remaining three types is in the course of distribution.

31. *Berseem or Egyptian Clover.*—As usual the berseem crop was grown on the Larkana and Sukkur Farms where facilities for Rabi irrigation exist. Like the previous years the entire buffalo herd at Sukkur depended for its winter fodder supply on this valuable fodder. The average outturn of green fodder on this Farm per acre amounted to 31,735 lbs. and the highest to 51,650 lbs.

The average figure of green berseem is lower than last year's one and is due to unusual effect of locusts and freezing cold.

The average seed outturn per acre in the current year amounts to 107 lbs.

Fruit

32. A new development in the line of this work took place during the year under review, by the appointment of a full time special officer. This officer was posted on the Mirpurkhas Farm in charge of this work with effect from 15th November 1926, to develop fruit culture as per scheme laid down by the Committee of Experts in May 1923.

All the other experimental work on cotton, wheat and other field crops have accordingly been dropped off on this Farm and it is now named as Fruit Farm.

33. Under the new scheme the existing area of about 8 acres under fruit cultivation will be extended to 21 acres, wherein several varieties of citrus family, together with the types of raisin and table grapes, and

Northern India and Bombay mangoes will be tested and the various phases of fruit industry studied.

34. The new area has been laid out and a few imported trees already planted, while arrangements are on foot to secure others. Much could not however be done in the way of extension due to difficulties of water-supply but now that a big well of 16 feet diameter with a fairly large supply of water in it is completed, it is expected that the extension of work will proceed rapidly.

In the meantime the old plantation has been kept up and improved upon as far as possible.

35. Fruit varieties with doubtful names have been or are being got identified and the necessary number of seedlings raised for planting on the new area as well as for sale.

36. In the year under review the Jamrao Canal worked badly and hence trees suffered from drought and consequently did not yield well. The total sale-proceeds of fruit amounted to Rs. 895-13-5. The number of cuttings and young plants supplied to the public amounted to 757 and realized Rs. 262-12-0.

Miscellaneous

37. *Implements and Machinery.*—In the matter of invention, introduction and study of the various types of implements of economic value the Department has now made a very considerable advance. The implements successfully introduced are :—

(*a*) The Sircar plough.
(*b*) The Meston plough.
(*c*) The Chattanooga plough.
(*d*) The Sirdar plough.
(*e*) The Cambridge roller.
(*f*) The Disc harrow.
(*g*) The Hand Archimedin screw.
(*h*) The Norag threshing machine.
(*i*) The Scraper.

These are all recognized to be useful and superior to the cultivators' original stock of a few crude and ineffective implements of husbandry. The local shops are scattered all over the advanced tracts, manufacturing the Sircar and Meston ploughs and the hand Archimedian screw and selling them in hundreds.

38. Among the new introductions in the year under review are :—

(1) The Poona plough ;

(2) The Hindustan plough ;

(3) The Oriental plough.

The last one is the imitation of the original type of Messrs. Ransoms, Sims and Jeffries but has been modified and cheapened by the Agricultural Engineer.

39. The imitation Oriental plough together with the Nos. 1 and 2 as well as others mentioned in paragraph 37 above are being subjected to further tests with regard to their draft, weight, depth of furrow, life, price and some such other factors which will be mentioned in the next year's report.

40. With regard to heavy machines under study on the Jacobabad Farm, Hoosier drill and the Punjab 3-coultered drill have given satisfaction while the De Pol threshing machine and Omnium self-raking reaper, on further and exhaustive trial, have not proved to be of practical value. The figures and details of working of these furnished by Mr. Abdur Rehman of the Jacobabad Farm have been recorded.

41. In the matter of mechanical cultivation, the use of Cletrac tractor was as usual made on the Jocobabad Farm. The following operations were conducted during the year :—

Name of operation	Days worked	Day's average output	Cost of service
			Rs. a. p.
Ploughing	22	2¾ acres	6 2 6
Clod crushing ..	6	4 „	3 8 6
Reaping	3½	7½ „	2 1 3
Threshing	18	4 acres produce or 37 maunds.	0 1 10 per maund of grain.
Chaffing	50	....	0 1 6 per maund of green and
			0 2 6 per maund of dry.
Pumping	20	3 acres	6 4 0 per acre.

For field operations this machine has no rival. Its advantages over other tractors on the market are these—

(1) It does not slip over light soil.
(2) It can be worked on irrigated lands.
(3) It can easily deal with head lands and corners.
(4) It turns in a short space.

Regarding the Fordson tractor received during the year for use in East Sind it was utilized on ploughing 41 acres, 10 to 12 inches deep with a 2-furrow mould board plough in dry soil, on the Seed Farm, Mirpurkhas, and about an acre and a half of the private land on rent. The working cost amounted to Rs. 4-11-0 including the driver's wages but excluding the overhead charges.

42. *Ginning Cotton.*—At the request of Messrs. Marshall Sons and Company a trial was made with the ginning of desi cotton in a Saw gin instead of in the Roller gin at the revolutions recommended by the firm.

The following speeds were tried :—

450 to 500 ; 500 to 550 ; and 550 to 600 per minute.

The engine could not pull load beyond 600 revolutions of the Saw gin. The samples of lint ginned at the speed of 450 to 500 revolutions were

somewhat similar to those taken out at the rated speed of the Saw gin for long stapled cottons but the samples taken out with the speed of 500 to 550 and 550 to 600 revolutions were much superior and showed no sign of damage to the fibre. Both these samples were sent to Messrs. Ralli Brothers at Karachi for opinion. They seemed to prefer the samples taken out at the speed of 550 to 600 revolutions but wanted larger samples for sending to Europe for further expert opinion.

Large samples will be supplied from the current year's crop and if it could be established that desi crop does not get injured in the Saw gin it will be an advantage to Saw gin the desi cotton when the cost of saw ginning is nearly 1/3rd of that roller ginned.

43. *The Buffalo Herd.*—The herd established on the Sukkur Farm with the object of improving the breed of buffaloes continues to fulfil its object satisfactorily.

The strength of the herd on 1st April 1927 was as follows :—

Adult buffaloes		8	
Heifers in calf		2	
Buffalo calves—			
Male	2	13	
Female	11		
Buffalo bull		1	
Births during the year were 6.		—	24

The total number of animals remained in milk was 8. The best animal gave 5,563 lbs. in 300 days as against 4,697 lbs. in 300 days last year.

44. An experiment to find out the economic value of feeding green guar with green jowar and thereby to effect reduction in the quantity of concentrates given to milch buffaloes in the usual standard of performance was undertaken by Mr. Ulvi. The results recorded show that green jowar mixed with an equal quantity of green guar in flower and pod required only one pound of concentrates for every 3 to 4 lbs. of milk yield.

This demonstrates the economic feeding value of guar.

45. *Rat Pest.*—A large scale demonstration in the method of rat destruction on rice was conducted in the year under report at the following centres on areas noted against each :—

Tando Mahomedkhan centre (Hyderabad District) ..1,703 Acres.
Shah Bunder Taluka (Karachi District) ..1,760 "

The work at Tando was started in the third week of August and finished by the close of October. In Shah Bunder Taluka it began early in September and was brought to a close by the end of October. Before the operations were started our attention was drawn to a new fumigant, *viz.*, Calcium Cyanide which seemed to have great advantage over Carbon Bisulphide, as a preliminary experiment with this chemical done near Tatta had proved very successful. This was ultimately used to a very great extent during the year.

The new fumigant has proved itself very effective and much cheaper than Carbon Bisulphide used previously, because it is more easy to handle. The total cost with it, including all charges except supervision, has worked out at less than 12 annas per acre. This method of dealing with the pest has created very favourable impression on the zamindars of the locality. Letters full of praise and containing expressions of gratefulness have been received and recorded in my office from those whose fields were thus treated. A couple of prominent zamindars of Tando Division, have already purchased apparatus and the fumigants for use on their lands in case of emergency.

Rat attack on wheat in the last cold weather was also successfully dealt with by the same method at two different centres, *viz.*, Jamesabad in Thar Parkar District and Dero Muhabat in Hyderabad District.

A large scale compaign in four different centres in the tracts annually subjected to the rat attacks is being repeated this year for educating the people further.

A bulletin describing the life history of the species of rats responsible for the damage done to crops, with the treatment found successful has been published.

46. *Agricultural Bias Schools.*—The number of schools worked during the year was eight as against six of the previous year. These are being worked on the same lines as those described in the last year's report. Annual examinations of these classes were held by the Assistants of the Department and future programme arranged.

Certain technical difficulties which had arisen in connection with the working of some of these schools were discussed in a Conference of the officers of the Educational and Agricultural Departments called at my request at Sukkur. The recommendations of this Conference are under consideration by the authorities concerned.

Two more schools are in the course of being started.

47. *Chellaro Plot.*—The Chellaro Plot (Taluka Mirpurkhas) started for the multiplication of cotton seed had the following area under cultivation in the year under review :—

101-4 acres under 4F American cotton.

380-0 acres under 27 W.N. cotton.

Out of the total production of 417,812 lbs. of seed cotton about 28,476 lbs. representing last pickings, etc., were rejected as unsuitable for seed purpose. The balance gave 221,336 lbs. of seed for distribution.

This sub-station showed a net profit of Rs. 17,303-1-10 after deducting Rs. 8,918-5-9 on account of Contingent expenditure as against a net profit of Rs. 16,027-12-9 in the last year.

The management of this sub-station conducted on the same principles as done by private owners is attracting attention on account of the excellent results that are being obtained.

48. *Boring Operations.*—At the request of zamindars of Karachi Taluka an Exploratory Boring machine was sent for from Poona for trial in the existing wells in Landhi-Malir tract. In all five bores were taken—four bores in the well of Mr. Nihchaldas Pleader at Darsano Chano and one bore in the well of one Mr. Boman Irani at Malir.

At Darsano Chano the water struck was not found to be sufficient for the requirement of a pumping plant whereas at Malir the bore gave a discharge of only 260 gallons of water per hour, in addition to the existing supply in the well.

49. *Manuring.*—Under this head green manuring with San hemp is being done on the Jacobabad Farm to grade up the sandy plots and on the Mirpurkhas Fruit Farm to improve the texture of heavy clay soil.

Trial of artificial manures supplied gratis by Messrs. Chilean Nitrate Committee on irrigated wheat is being carried out for the last two years. Results of 1925-26 were very encouraging but those of the year under review were not to expectation, due to abnormal conditions. The trial will however be repeated to get definite data.

A leaflet issued by the Department on the right method of handling farm yard manure is being constantly brought to the notice of cultivators.

50. *Publications.*—The following Bulletins and leaflets were issued by the Department in Sind during the year.

Bulletin No. 128	..	Cotton cultivation in Sind by Khan Bahadur Gulmahomed A. Rehman.
Bulletin No. 134	..	Mureh buffaloes in Sind by Mr. A. M. Ulvi, B.Ag.
Leaflet No. 32	..	Some of the important Fruit plants in Sind.
Do. revised—		
Part I	..	Mango .. Printed.
Part II	..	Orange } .. In Press.
Part III	..	Vine }
Part IV	..	Fig .. Printed.
Leaflet No. 33	..	Rab substitutes for rice seedlings.
Leaflet No. 34	..	Preventive measures against pest on Lucerne.
Leaflet No. 35	..	Oriental Plough.

Propaganda and Service

51. Intensive propaganda in certain selected areas with a Taluka as a unit fixed by Government Orders in 1921-22 and subsequently extended at the recommendation of the Divisional Board of Agriculture in Sind is being carried out in 20 Talukas noted in the margin.

1. Hyderabad.	11. Mirpur Mathelo.
2. Halla.	12. Mirpurkhas.
3. Shahdadpur.	13. Jamesabad.
4. Tando Allahyar.	14. Digri.
5. Sukkur.	15. Sinjhoro.
6. Ghotki.	16. Nawabshah.
7. Kambar.	17. Guni.
8. Larkana.	18. Badin.
9. Dero Mohbat.	19. Tando Bago.
10. Shikarpur.	20. Jacobabad.

Problems in the rest of the Province are also attended to whenever there is a call.

52. The chief material of propaganda are superior seeds, implements and improved methods of cultivation.

The seeds handled are :—

(*a*) The improved strain of desi cotton known as 27 W.N.
(*b*) American cotton.
(*c*) Wheat.
(*d*) Rice.
(*e*) Jowar.

The merits of these have been mentioned under the description of each in pages of this Report.

53. The total quantity of 27 W.N. seed produced and distributed in the year under review by the Department was 177,160 lbs. as against 442,308 lbs. distributed last year. Of this quantity 175,520 lbs. were the produce of our Chellaro Plot. In addition to this quantity the seed obtained from certified growers was directly sold by the Firms to zamindars. These quantities though greater than the quantity distributed last year was yet insufficient to meet the demand in full. Our seed organization is however steadily developing and we hope to be in a position to meet the increasing demand to the highest possible limit.

54. *American cotton.*—The variety in demand is 4F. The progress that the cultivation of this cotton has made in spite of the adverse irrigation conditions is wonderful. The total area cropped in the District in East Sind in the year under review was returned at 36,302 acres against 11,000 acres of the last year.

This is the highest area ever reached under exotic cotton in Sind and is a clear indication of the fact that given normal irrigation conditions there are possibilities of suitable long stapled cotton rapidly replacing the Sind local.

The quantity of pure seed of 4F variety produced on the Chellaro Plot and Seed Farm in the current year was 63,140 lbs. Of this quantity 50,040 lbs. have been issued to private seed growers for multiplication. The balance has been utilized on the farms for sowing. For the general cultivation of this cotton in the District a large quantity of the certified seed has been purchased by zamindars direct from Firms. The seed so distributed was from the crop originally raised from the Departmental seed and sold to the Firms under the multiplication scheme controlled by the Department.

In addition to the above 6,150 lbs. were imported from the Punjab for a zamindar in Hyderabad District.

55. *Wheat.*—The kinds and quantities of wheat seed issued of each variety were as under :—

Pusa 12	.. ..	36,080	lbs. from Jacobabad.
Pusa 12	.. ..	2,241	,, from Larkana.
A.T. 38	.. ..	2,270	,, from Jacobabad.

A.T. 38	..	..	604 lbs. from Larkana.
C.P.H. 47	..	..	1,902 ,, from Jacobabad.
C.P.H. 47	..	..	573 ,, from Larkana.
G.S. 25	..	..	1,232 ,, from Jacobabad.
G.S. 25	..	..	89 ,, from Larkana.

The bulk of Pusa 12 as usual remained confined to North Sind where the conditions for its success are more favourable. The area under it is estimated to have reached over 15,000 acres annually.

Punjab 11 and G.S. wheats are suitable for cultivation in East Sind but their cultivation has been largely suspended due to failure of water in the Rabi season yet 8,610 lbs. of Punjab 11 seed were imported from the Punjab in the current year and distributed in suitable centres for multiplication. Owing to attack of locusts however the crop failed.

56. Rice seeds of the strains of Kangani, Jajai and Prong are now regularly issued for cultivation chiefly through Seed Societies in the Larkana District on the understanding that we could buy back the seed for further distribution. The quantity distributed in the current year amou nted to 35,537 lbs. as against 8,240 of last year.

57. *Jowar.*—One thousand pounds of Alakh—one of the four varieties dealt with on the Larkana Farm—have been given out in the current season for multiplication of seed. The seed of the remaining three varieties, *viz.*, Baghdar, Saouro Kartuho and Janapur Red is in the course of being distributed as far as the supply of the seed would permit.

58. *Implements and Machinery.*—Two types of the improved light ploughs, *viz.*, the Sircar and the Meston are now entirely manufactured by the local " Mistris " in various centres and their annual turn over is very considerable. A chart showing the extent of country covered by the improved plough is enclosed.

Of the heavier types of ploughs and other machinery issued by the Department their names are noted in the margin.

1. Monsoon Plough.
2. Chattnooga Plough.
3. Chaff-cutter.
4. Cambridge Roller.
5. Norag Threshing Machine.
6. Hand Archimedian screw
7. Iron crapers.
8. Steel Plough shares.

59. In the matter of improved methods of cultivation we had our usual demonstrations of sowing cotton in lines as against broadcasting the seed. In a year of late inundation which has now become the feature of irrigation, rapidity in sowing irrespective of any consideration for the quality of work, becomes the rule. Hence the area operated upon was far too below the original programme. The method is however appreciated by the public inasmuch as fields can be seen cultivated with this improved method independently, in areas where irrigation conditions admitted this to be done.

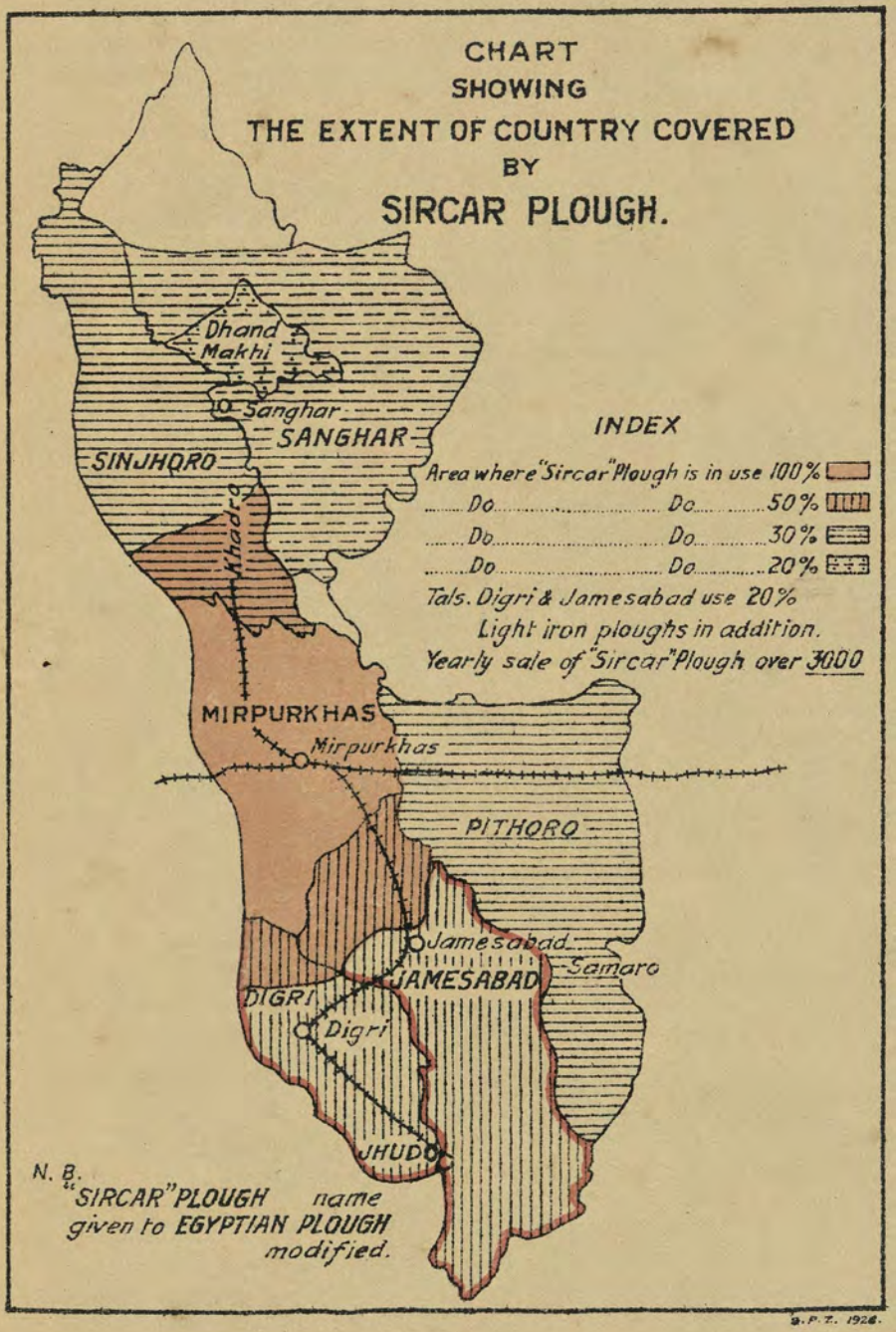
CHART
SHOWING
THE EXTENT OF COUNTRY COVERED
BY
SIRCAR PLOUGH.
Dhand
Makhi
Sanghar
SANGHAR
SINJHORO
Khadra
INDEX
Area where "Sircar" Plough is in use 100%
Do Do 50%
Do Do 30%
Do Do 20%
Tals. Digri & Jamesabad use 20%
Light iron ploughs in addition.
Yearly sale of "Sircar" Plough over 3000
MIRPURKHAS
Mirpurkhas
PITHORO
Jamesabad
Samaro
JAMESABAD
DIGRI
Digri
JHUDO
N. B.
"SIRCAR" PLOUGH name
given to EGYPTIAN PLOUGH
modified.
S.P.T. 1926.

Demonstrations with the preparation of land with our improved implements for Bosi wheat cultivation were also given in two centres on the Jamrao Canal. The result was gratifying.

60. The small sub-station at Jamesabad started some years ago with the object of educating zamindars in the new and improved methods of cultivation was again successfully run. It gave a net profit of Rs. 407-10-6 which is significant looking to the agricultural season which was one of the worst on record.

61. The village to village demonstrations with improved implements and seeds is the usual routine now and was carried out both by the Departmental staff and the Taluka Development agencies in 186 villages.

62. In addition to the above one big Show at Jacobabad (Upper Sind Frontier) was organized and successfully run. The new feature of this show was the inclusion of cattle section, which was very encouraging.

63. Among other services rendered to the public were the help given by our Mechanical Assistant in connection with the pumping and boring operations. The sites were visited by the Mechanical Assistant, plans and estimates prepared and assistance rendered in the suitable type of machinery required.

The erection of the machinery wherever undertaken under his advice was supervised when required.

64. The Taluka Development Associations of which three are directly managed by the Department continued to do satisfactory work. They had their usual meetings in the course of the year and their supervisors and Kamgars had a large share in the usual village to village demonstrations of improved implements and seeds. The seed distributed in their talukas was largely handled by them under the guidance of the Department.

Two more Associations are in the course of formation.

65. I assumed the duties of the Chairmanship of the Divisional Board of Agriculture from November 1926. There was one meeting of the Board in December 1926. The other two will be held before November 1927.

GULMAHOMED A. R.,

Deputy Director of Agriculture, Sind.

APPENDIX I

WORK DONE UNDER THE PROFESSOR OF AGRICULTURE, POONA, DURING THE YEAR 1926-27

Charge.—Mr. B. S. Patel held the charge of this office till the end of March of the year after which Mr. V. G. Gokhale officiated.

Nature of work.—The principal work of the section under the Professor of Agriculture consists of the teaching of agronomy and dairying which occupies nearly half of the total teaching work of the Agricultural College, Poona.

For teaching the practical side of the above subjects a large farm and a dairy involving an expenditure of about a lakh of rupees, and considerable administration have to be run. These two institutions also serve as centres for demonstrating, to a large number of visitors, improved methods of crop production, the use of improved implements, the proper methods of rearing livestock and poultry. The farm is also looked up to as a source of supply of seed.

Owing to the increase of hire, sale and repair business of implements it was decided to stop this activity which was carried on at the Agricultural College Farm in the past.

This section has also to deal with a very large number of agricultural enquiries and to carry on such research and investigation as would be permitted after doing full justice to the abovementioned primary duties.

The Presidency Agricultural Show of 1926 engaged during the year considerable attention of this section, practically every member of its staff being called upon to do one or the other work. The Professor of Agriculture (Prof. B. S. Patel) worked as Secretary of the Field Produce Section, the Dairy Section and the Lecture Committee and Mr. K. S. Kulkarny, Lecturer in Agriculture and Superintendent, College Farm, was appointed Secretary of the Transport Storage and Labour Supply Section, besides having to work on several other committees.

Teaching

The teaching at the college was to some extent prejudiced due to almost every member being called upon to assist the Presidency Agricultural Show of 1926.

There were 18 students specializing in crops, and 5 in Dairying and animal husbandry. Subject of rice could not be taken up owing to shortage of staff but the difficulty has now been removed by the appointment of the third Lecturer in Agriculture.

Some experiences furnished by the year's work at the institutions for practical work are noted below

The Farm

About 30 acres of good land of the farm was kept at the disposal of the Presidency Agricultural Show, which compelled us to utilize some of the poor land under cultivation for students' work.

Season.—The rainy season was an unusally wet one. The total rainfall of the year was 30·96″ as against the average of 27·11″.

The Rabi season was totally a dry one and this had very bad effect on *rabi* dry crops so much so that we had to irrigate them to save them from total failure.

Amongst the *kharif* crops *bajri* and groundnut were two of the crops most affected by the heavy rains ; in fact *bajri* gave only about 50 per cent. and groundnut only 60 per cent. of a normal crop. September rain had a detrimental effect on the flowering of N.R. Cottons which reduced the yields by 30 per cent. Irrigated crops on the whole fared well except that potatoes and chillies in the rainy season and onions and cabbage in the winter grew very unsatisfactorily.

The crop of chillies which was affected by " leaf curl " was an absolute failure inspite of repeated spraying and dusting. It is suspected that the disease may be more " mosaic " than due to wilts or thrips, as declared by the Plant Pathologist.

Onions, specially the crops for seed was badly affected by thrips, which inspite of spraying with tobacco decoction did not much improve. It is now understood from the Entomologist that tobacco decoction which was recommended in previous years is no good and that kerosene emulsion might prove superior. This would be tried in case of future attacks.

The Dairy

Besides affording facilities for practical teaching this is intended to demonstrate the possibilities of modern dairying as a commercial business, and to serve as a centre for breeding pedigree animals of *Sindi* cows and *Surati* buffaloes.

The strength and composition of the herd has practically remained the same as in the previous year, totalling 225 heads.

The following table compares the performance of the animals during the year with that of the previous one.:—

Year	Average number of adult animals	Average yield of the herd in lbs.	Analysis of column 2		Average yield of cows	Average yeild of buffaloes	Remarks
			Cows	Buffaloes			
1925-26 ..	77·83	3,338·5	34·25	43·58	2,892·68	3,687·0	
1926-27 ..	75·74	3,235·6	34·16	41·58	3,075·90	3,366·9	The maximum average yields obtained during the year are : Cow carrie 5,526 lb. Buffalo Louise (Calf suckling) 5,683 lb.

The fall in the average yield of the buffaloe herd is due to the less number of adult buffaloes, and more number of fresheners, the adults being generally high yielders than fresheners. The advanced adults

had to be disposed off in order to make room for promising fresheners so as to keep the whole strength within the number manageable by the present unit.

The sub-joined table compares the financial aspect of the year under report with that of the previous year :—

Milk production

Year	Average number of adult animals	Average number of animals milked	Total milk production in lbs.	Average milk yield per head per year in lbs.	Cost of production of 100 lbs. of milk in rupees	Total milk fed to calve in lbs.	Total milk sold in lbs.	Money realised per 100 lbs. of milk sold Rupees
1925-26 ..	77·83	62·43	259,842	3,338·5	*(19·4) 17·7	22,538·5	237,303·5	18·06
1926-27 ..	75·74	61·78	245,068·5	3,235·6	*(20·05) 17·08	36,260·5	208,808·0	18·26

* Figures in brackets show the cost of 100 lbs. of milk available for sale after feeding calves.

The increase by Re. 0·65 in the cost of producing 100 lbs. of milk excluding that fed to calf during the year under report as compared to the previous one is mainly due to the larger quantity required to be fed to calves consequent upon the late auctions and a larger number of calves being retained during the year under report.

The value realised for milk, though a trifle more than that of the previous year, is still less than the cost of production including the feeding of calves. While it is impossible to get a better value for the produce, or to bring about any appreciable economy with the present milk yields, the only avenue to be looked to for making the dairy business profitable round about Poona is to breed animals giving higher averages than at present. This has already been taken up on systematic lines for some years, and the results with the buffalo bull " Dairy pride " on some of the dairy-bred heifers of known pedigree show sufficient promise of achieving the desideratum.

The only specially noteworthy features of fodder raising of the dairy are that peas and oats and lucerne have yielded higher by about 20 and 30 per cent. respectively this year over the previous year. The increase is due to the higher seed-rate in the case of peas and oats and higher manuring in the case of lucerne.

Poultry.—This which forms a prominent cottage industry to agriculture was started only late in the previous year with the object of furnishing a nucleus central poultry breeding station for the supply of high class birds and for investigation and demonstration of the best methods of management under conditions of this side of India. The end of the year under report brings us the experience of fifteen months with the two breeds—(1) White Leghorn and (2) Australorp (Black Orpingtons from Australia), which having acquired some reputation of suitability to Indian conditions have been adopted for a start.

About half the number of birds and three-fourths of chicks hatched from the first setting of eggs of the original foundation stock died, the birds with sunstroke and green diarrhœa and the chicks as a result of ordinary casualties in artificial rearing.

The foundation stock birds which are reported to give an average annual output of about 250 eggs showed the following performance :—

	Original birds	Poona Progeny
While Leghorn	112	167 Average of 17.
Australorp	112	150 Average of 17.

Seventy-two birds and 203 eggs were supplied to two Government institutions and 21 public bodies for the purposes of breeding.

The cost of raising the birds came to Rs. 550, excluding the pay of a fieldman in charge, and the value of the income amounted to Rs. 772, thus giving a profit of Rs. 222 over a flock of 160 on an average young and adults. It must be noted here however that this includes Rs. 294 for 22 birds bought by fancy enthusiasts and Rs. 105 for 166 dozen of eggs. The ordinary poultry keeping farmers would never be prepared to pay this high price even for breeding purposes. But it is certainly in fitness of things for Government to maintain a poultry breeding station even at a loss in order to make available at cheap rates high class birds for this cottage industry most fitted to be subsidiary to agriculture.

Research and Investigations

The successful results of the investigations of growing turmeric and ginger on broad ridges were prepared for publication by Mr. H. M. Desai, B.Ag., Lecturer in Agriculture.

Investigations into the economic functions of Tillage Implements and their Improvement.—This which was so generously continued to be financed from the Sir Sassoon David Trust Fund, was further pursued in its third year under the immediate direction and control of the Professor of Agriculture. As a result of three years' work the following tentative inferences can be drawn :—

(1) Deeper preparatory tillage does not give better crop results.

(2) Different kinds of preparatory tillage affect the moisture content below the loosened layers to the extent of 1 to 2 per cent. (on the air dry basis).

(3) The preparatory tillage helps to reduce the perennial weeds to a considerable extent.

(4) Ploughing the soil increases the proportion of nitrate nitrogen which results into some increase in the yield.

No investigation could be taken by any other member of the staff due to the Presidency Agricultural Show having occupied them fully in any time that could be spared after satisfying the needs of teaching.

Personal

Every member of the staff put in the best of his endeavour and ability in carrying on his duties and it is hoped that they would distinguish themselves similarly by carrying on investigations of whatever sort their primary duties of teaching may allow.

V. G. GOKHALE,

29th July 1927. Acting Professor of Agriculture.

APPENDIX J

Report of the work of the Agricultural Chemist to Government of Bombay, Poona, from 1st July 1926 to 30th June 1927

1. The work under the Agricultural Chemist may be conveniently divided into four sections as given below :—

(1) Analytical work done for the public and for the various sections of the Agricultural Department and other Government Departments.

(2) Investigation work.

(3) Teaching at the Poona Agricultural College.

(4) Water-finder work.

It may be stated here, before mentioning the work under each section, that the work is increasing year after year under each head and the analytical Laboratory and water-finder work have become very popular and have gained public faith to such an extent that the people are making the fullest possible use of these.

Analytical Work

2. The number of samples received for analysis continues to be as high as ever. In the year under report 1,316 samples were received. This number does not include samples in connection with the investigation work carried on in the Chemical Laboratory. The classification of samples shows that there were 310 soils, 257 manures, 386 waters, 161 feeding stuffs, 83 oil seeds, 39 plants and their parts, 24 milk and its products, and 56 of various types which may be classed as miscellaneous.

3. The samples from Government Departments numbered 867. Many of these were analysed in connection with the various problems under investigation in the different sections of the Agricultural Department.

4. Soil samples were analysed for the Professor of Agriculture, Poona, in connection with his study of the "Economics of tillage and implements" which he is carrying on for some time past. Other soil samples include those from the Soil Physicist in connection with his study of Dry Farming Experiments or soils from Kumta Farm in connection with rice experiments and so on. The Manures consisted of the usual manures for use of the farms and also artificial farmyard manures which are under experiments. This line of experiments has been developed a good deal and good results are expected out of these. Some crops were analysed for their total manurial constituents in order to estimate their manurial requirements. Some time ago it was alleged that the cotton seed exported from Bombay had deteriorated in its oil contents. A number of samples of different types of cotton seed were analysed to find out whether there was any truth in the allegation. The analytical figures showed no deterioration.

5. As in previous years a large number of samples came from actual cultivators and from men engaged in agriculture or agricultural industries. The total number of samples was 449. This shows, as indicated above, that the agricultural public are making full use of the facilities offered by way of analysing their samples and the Chemical Laboratory continues to be as popular as ever. Out of the 449 samples from the public 147 were those of manures. Careful cultivators understand fully that they pay for the manurial constituents and not for the bulk they buy. The other samples were food-stuffs, soils and waters.

Investigation Work

6. Investigation of small problems referred to the Agricultural Chemist has been included under analytical work and it is only the larger problems which need mention under the heading " Investigation work." All the problems mentioned in the programme for 1926-27 were under investigation.

7. The study of the buffalo casein with regard to its composition and digestibility has been completed and will soon be prepared for publication.

8. A special investigation was taken up to find out a suitable method of preparing Vinegar from the various sugar containing substances. A short and a very successful method has been found out and actually vinegar on a large scale was prepared for the Agricultural Show. The process has been published in the form of a Departmental leaflet.

9. In the last year's report it was mentioned that an orange plantation suffering from die-back disease was improved by preparing trenches to give aration of roots. Further experiments were continued. They confirm the results obtained last year. The improvement is marvellous. The treated plants (76 in number) yielded 12,000 fruits while the untreated plants (74) yielded only 440 fruits. An article on this has been published in the Pusa Journal.

10. The work done in testing the cleanliness of milk in the Poona City has been sent for publication in the Pusa Journal. It has been accepted and will soon be out.

11. The work on the recuperation of nitrogen in the Deccan soils was continued as indicated in the programme. This is not yet completed.

12. The work in connection the manuring of rice at Karjat has been carried out in co-operation with me. The results obtained are valuable. It is expected that these will be soon published.

Teaching

13. I was responsible for the teaching of Chemistry and Geology to all the classes at the Poona Agricultural College. The teaching work has in recent years become very heavy and the staff under me for teaching do not find time to carry on any investigation but I am glad to say that every one of them is anxious to do research work and utilises fully his vacation and any other time that he may get to devote to research.

Water-finder Work

14. There are three assistants under me for water-finding work. They all work with the automatic machines. One of the assistants is put at the disposal of Major Pogson to test the places located by him. My assistant sends me the readings obtained with the machine and I send the interpretation to Major Pogson predicting the quantity of water and the depth. One hundred and nineteen sites were tested for Major Pogson. The other two assistants take tests of those who apply for the machine or for advice with regard to underground water. In the year under report water-finding work was also done for Baroda and Kolhapur States and for Khandesh and Kolaba District Local Boards. The work was practically evenly distributed over the whole of the Deccan. In all 495 sites were tested during the season in the year under report. There is a great demand for the water-finder and with the present number of machines I am not able to satisfy the public demand. I have a great desire to put my experience on scientific basis so that it may be useful to other workers many of whom are not able to locate sites on which to use the machine, or to interprete the readings of the machine correctly. But I dot not know when I can get the necessary time and some funds to do this. One of my assistants was deputed to Indore State for water-finding work for three months.

15. I was in charge of the Chemical section throughout the year under report. Mr. N. V. Kanitkar who is the permanent Assistant Professor of Chemistry was transferred in November 1926 to act as Soil Physicist to Government of Bombay. In Mr. Kanitkar my section has lost, although temporarily, a man of very high qualifications and long experience, both in research and teaching. Mr. V. G. Patwardhan, M.Ag., M.Sc., who is also an experienced man is appointed to act as Assistant Professor of Chemistry. Mr. D. M. Ranade, Senior Laboratory Assistant, was on leave from 20th April to the end of the year under report. I am glad to say that all my assistants have worked hard and satisfactorily. I cannot, however, close this report without a special mention of Mr. S. B. Tambekar my office clerk. The office work has increased very much on account of new works such as water-finding, etc., attached to my section. Mr. Tambekar is doing his best to keep the work uptodate but it is beyond one man's capacity. I have, therefore, requested for a second clerk and it is hoped that sanction will be granted.

D. L. SAHASRABUDHE,

Agricultural Chemist to the Government of Bombay.

APPENDIX K

Work done under the Economic Botanist to the Government of Bombay, Poona, for the year 1926-1927

The undersigned held charge of the post of the Economic Botanist to the Government of Bombay, throughout the year. Mr. L. B. Kulkarni, M.Ag., acted as Assistant Professor of Botany.

2. The Economic Botanist held charge of the current duties of the Plant Pathologist to the Government of Bombay till 10th September 1926.

Education

The teaching of botany to the College classes was conducted as usual. The Economic Botanist, the Assistant Professor of Botany and one Assistant Economic Botanist sharing the work. On account of the sudden departure of Mr. W. V. Joshi., B.Ag., Demonstrator in Botany, Messrs. S. R. Godbole, and D. V. Narayanayya, assisted instead.

2. Seven students specialised in Advanced Plant Breeding according to the newly introduced curriculum including three of the Diploma Course. Four candidates of the Degree Course and one of the Diploma Course passed.

3. Students of the Loni Agricultural School, the Training Colleges for Men and Women, Poona, the Arboriculture Class and the Nature Study Club, took advantage of the equipment and staff of the Botany branch. In addition demonstrations were held during the visit of His Excellency the Viceroy and of the South African Deputation and during the Presidency Agricultural Show in October 1926.

4. Arrangements were made and help was rendered for special courses of study as follows :—

(1) For Mr. Shamkishan Kaul of Ratlam State, in the study of planning, planting and management of polo lawns.

(2) For Mr. Karunaratna in the special study of rice breeding.

5. The Botanical department had their share of arduous work in connection with the Presidency Agricultural Show held in October 1926. I was in charge of all local arrangements in connection with the exhibits of the Research Section. The Head Clerk Mr. M. A. Deo helped the account branch of the Exhibition Office; Mr. G. Y. Gaikwad, Laboratory Assistant, did very useful work in connection with the preparation and maintenance, of research exhibits.

Seed Testing

During the year 304 samples of seeds were tested ; of these 127 were crop seeds, 150 weed seeds and 27 grass seeds. Many of them were in fact tested several times over as the tests were for experimental purposes—such as trial of effect of different strengths of acid or of hot water at different temperatures or of shade and exposure on certain weed and other seeds.

2. Two tests on hard-coated seeds of crops such as *Phaseolus radiatus* and *Phaseolus mungo* have shown that the seeds show a large per cent. of ungerminating hard seeds, soon after harvest but that the percentage improves as the next sowing season approaches.

Enquiries and Advice

Two hundred and sixty specimens were identified for Government and the public. The number of enquiries dealt with was 89 of which 18 were about drugs, 8 about fibres and the rest of a miscellaneous nature.

2. Fourteen enquiries hailed from outside the Bombay Presidency came from Indian States and foreign countries.

3. Seeds and plants of the following species were supplied to the persons mentioned against each :—

(1) Seeds of Cassia angustifolia supplied to Officer in charge, Medical Store Depôt, Bombay.

(2) Seeds of various flower plants supplied to Agricultural Officer, Andamans.

(3) Cotton seeds supplied to Mr. D. L. Seth, Surat.

(4) Cotton seeds supplied to Lecturer in Horticulture, Agriculture College, Cawnpore.

(5) Seeds of quick growing trees for Kanara supplied to Superintendent of Agriculture, Station, Kumta.

(6) Seeds of Sesbania aegyptica supplied to Assistant Engineer, Dakor.

(7) Seeds of several indigenous plants Mr. P. Correa Afonso, Goa.

(8) Seeds of plants belonging to Lobeliaceae and Linaceae supplied to Mr. M. Simonet, France.

(9) Seeds of Hedge plants supplied to Mr. Ambrosa J. Gonsalves, Honavar.

(10) Seeds of indegenous plants and grass species supplied to Mackinnon Mackenzie, Bombay.

(11) Seeds of Cajanus indicus supplied to Botanist in charge of Agriculture Explorations, Bureau of Plant Industry, U. S. A., Washington.

(12) Seeds of Tectona grandis (Teak) supplied to Director, Ministry of Agriculture, Egypt.

4. Another supply of pollen of five species of grass was supplied to Major Tressider, Surgeon to His Excellency the Governor of Bombay for his research on Hay Fever.

Researches

1. *Lantana Eradication.*—Encouraged by the perusal of the results reported last year, the Forest Department placed at our disposal a large

area of 5 acres on the slopes of the mountain at Donja which was treated in December 1926.

(2) The plants were cut by big knives (local Koitas). An attempt was made by using the ordinary axe but Koitas saved time and labour and the nature of the cut was approximately similar. Sodium arsenite was applied on the cut surfaces. The charges of the one operation per acre were calculated at Rs. 25-9-0. Till June 20th, 1927 there were no sprouts from the cut plants. The condition presented after the end of the monsoon will enable a conclusion to be drawn.

2. *Potato Experiments.*—The potato varieties stored in the hot weather of 1926 at Mahableshwar and Poona and cultivated in the Kharif season at Peth gave yields which were far lower than what was expected from previous experience. The ratio of seed to yield of Mahableshwar Stored Great Scot and Italian White was (1 : 2·3) and (1 : 3·3) respectively while the corresponding figures of Poona stored seed were (1: 0 and 1: 4·9). In the case of Italian White Poona Stored seed gave about 48 per cent. more yield than Mahableshwar seed.

(2) The seed of the two varieties was taken to Mahableshwar for cultivation in the rabi season (of 1926-27) in comparison with a freshly imported lot of Italian seed as decided by the Potato Committee. The result of the cultivation was that the Italian White fresh import gave a good yield of 7 times the seed while the Great Scot (Peth) and Italian White (Peth) yielded 1·99 and 1·5 times the seed. This produce was stored again in the hot weather of 1927 at Mahableshwar. For comparison, there was stored in the same period another lot at Poona. The final result was that not only was the amount of rotting very high in storage both at Mahableshwar and Poona in 1927 but that there was very little difference between the amount of rotting in the two places.

(3) The Potato Committee has come to the conclusion that " while further experiments in storage under specially arranged conditions at Mahableshwar may lead to a method by which storage rots can be reduced, the proposal for a system of general storage of seed potatoes at Mahableshwar must be given up, and reliance placed for future supply of reasonably disease free seed or on seed imported either from the Himalayas or from abroad. "

German Potatoes.—The trial of these was unfortunately unsuccessful on account of (1) Late arrival of seed, (2) the unusually heavy incidence of attack of the potato moth and of rots in storage.

3. *Safflower.*—The high yielding strain of No. 7 has been further multiplied and there is on hand about 200 lbs. of seed for trial in out-stations in comparison with local seed.

4. *Castor.*—Work on study of the variations has been continued. About 1,000 plants have been morphologically examined and variations of 38 characters recorded. Selections out of these on the basis of requirements of trade have been made and are under further study in the field.

5. *Eradication of Mimosa Pudica.*—A scheme of experiments was drawn up and sanctioned by the Director in 1926. The main results are :—

(1) *Treatment of seed with sulphuric acid.*—The strength of acid varied between 2 per cent. to 10 per cent. and the hours of soaking varied between 1 to 24. The germination per cent. also varied between 1 to 16. The maximum of 16 per cent. was of seed soaked in 5 per cent. acid for 3 hours.

(2) *Treatment of seed with hot water.*—Seeds soaked in boiling water for 10 minutes gave 80 per cent. germination. The second best was 60 and 66 per cent. by soaking in water at 80°C for 10 minutes. It appeared that very high temperatures are favourable to germination.

(3) Germination tests were made of seeds exposed for 4 hours to different temperatures in an oven before sowing ; exposure to 50°C gave 15 per cent. germination while those at 40°C. to 60°C gave 7 to 14 per cent. respectively.

(4) Exposure to direct sunlight for 3 days at 8 hours a day gave a lower per cent. of germination, *i.e.*, from 21 to 31 per cent. while the ones placed in shade gave from 22 to 42 per cent. germination.

6. *Bajri Research.*—Among the selections that have been under observation during the last five years, seven have been found to yield considerably more than the local bajri. One of these, No. 37 appears to be extremely promising ; its yield being forty per cent. above the local bajri. The yield of other six strains shows an increase of ten to twenty per cent. over the local variety. It has been decided to test the yielding capacities of all the above strains in the kharif season of 1927 by growing No. 37 on a 2-acre area and the rest each on half an acre plot.

(2) Fifteen high yielding strains selected from Akola bajri last year were tried. Only nine of these have been found promising and these will be tested on 1927 season. A selection of awned bajri showing inheritance of awns has been found to yield more than forty per cent. higher yield than the local variety. This will be tried on a three-guntha plot in the kharif season of 1927.

(3) Ten strains have been continued for critical morphological study. The study indicates considerable amount of purity in respect of leaf-hairiness, some being over ninety-five per cent. pure.

(4) Drum experiments for determining the water requirement of bajri plants were conducted during the rainy season of 1926. The average amount of water required was 247·8 times the dry matter produced by the plant while the figure in 1925 was 173·5. In 1926 experiments a smaller percentage of water, was maintained in the drums resulting in comparatively poor growth and this was ultimately responsible for higher water ratios.

Grass Research.

7. (1) *Kalas Investigation.*—The main results are :—

(*a*) *Comparison of soil and vegetation within and without the fence.*—Within the fence there is a definite increase of organic matter and soil

moisture, and there is deeper moisture penetration. The vegetation within the fence is denser, taller and produces more viable seeds. There is a marked increase in the proportion of perennial stumps.

(2) The differences between burnt and unburnt areas are not striking and require discussion. Certain species produce growth quickly after burning. Others do not, and a few are killed.

(3) The hilly and low and shallow parts of the fenced area show each characteristic figures as to organic matter, moisture and moisture penetration with corresponding differences in flora.

Effects of drainage and run-off.—The drain has been most effective in penetrating water logging. Seeds were brought down by the water in the drain and germinated copiously in the bed of the drain.

Effect of stones on soil moisture.—Stones and vegetation definitely assist in retaining soil moisture. Readings taken at the end of January showed 28 and 62 per cent. more of it respectively.

Rotational grazing.—Experiments were carried out in five places as last year. The nature of soil, the distribution of grasses, weights and class of cattle, etc., were recorded from time to time. In all places it was found that after the cutting of all grass in November and December no ratoon growth was secured for cattle to graze upon.

2. *Bhamburda Forest Area.*—In the 10-acre Blocks I, II and III the animals admitted to grazing from middle of August were 4, 5 and 4 respectively. There was sufficient feed till end of February after which they were stall fed from dry grass cut in November from Block IV which was left to grow grass before then. The yield of grass from Block IV was 1,053 lbs. per acre.

3. *Jalgaon Forest Area.*—In Block I, II and III. The animals admitted to grazing from end of July were 3, 4 and 4 respectively, being at the rate of 2·7 acres per animal. As a result of good rainfall this year it was found that plenty of grass grew up and that the areas were under-grazed. Block No. IV treated like that at Bhamburda yielded 742 lbs. of dry grass per acre.

4. *Padmavti.*—Two animals, *i.e.*, at the rate of 4½ acres per animal were put into each of the three blocks in the first at the end of July and in the rest early in September. No feed was available after December. Block IV yielded grass at the rate of 150 lbs. per acre.

5. *Kandivlee.*—The blocks were opened for grazing with 22 animals in each Block (I and II) on the 4th and 14th December respectively after green grass was cut and put in silo. The yield of green grass was on an average 24,848 lbs. per acre and some hay was obtained at the rate of 3,750 lbs. per acre.

6. *Chharodi.*—Block I was opened for grazing on 22nd July 1926 with one animal for 3 acres and blocks II and III on 15th August 1926 with one animal in each. They were undergrazed. Block IV was cut giving 5,111 lbs. of partially green grass per acre.

Cross Country Survey.—This survey records the distribution of different species of grass along a line across the country from Lonavala to Sirur—through tracts varying in soil and rainfall.

Grass Trade at Talegaon.—A study is made of the extent of the trade as also of the sources and quantities of the grass supply and transport from the place.

Study of nutritive value.—Analysis of samples of representative grass species and localities are being made by Dr. Warth for us and it is expected that considerable light will be thrown on the value of the grasses for feeding purposes by the analysis.

Publications

A second edition of the book on "Rose Cultivation" in Marathi was published by Prof. G. B. Patwardhan, in Poona.

2. "Aquatic Weeds of the Deccan Canals" was published in the Poona Agricultural College Magazine Volume XVIII, No. 2 page 107 (1926) by Mr. D. V. Narayanayya.

G. B. PATWARDHAN,
Acting Economic Botanist.

18th February 1927.

APPENDIX L

Annual Report of the Work done by the Crop Botanist to Government of Bombay, Poona, for the year 1926-27

Mr. R. K. Bhide continued to hold the charge of the post of the Crop Botanist to Government of Bombay, Poona till March 8th, 1927 when he retired after a steady career of increasing utility and responsibility in the line of both the Pure and the Applied Botany.

Subsequently the charge of the office was with Dr. W. Burns, D.Sc., Joint Director of Agriculture, to the end of the official year.

When Mr. Bhide retired the season's work both at the Rice Breeding Station, Karjat and the Wheat Breeding Station, Ganeshkhind Botanical Gardens, Kirkee, was almost complete under his able guidance and the report of the work at these two stations recorded below is almost such as has descended directly through his pen.

Rice

Season.—This year the monsoons started from the 11th June. The sowing was commenced on the 9th June and was finished in about a week's time. The prospect after sowing was, however, very gloomy. There were no rains at all for a long period. This caused loss of a large percentage of seedlings through lack of moisture in seed beds. The timely rain of 27th June, however, improved the situation. There was yet shortage of seedlings for transplantation which however was partly made up by free tillering owing to reduced competition. Transplanting commenced on the 9th and lasted till the 19th July. The rains during transplanting and a fortnight afterwards were moderate, but the next two months' period (August and September) was one of heavy precipitation amounting to 86 inches with strong winds and low temperature. The total rainfall during the year amounted to 155·79 inches, which is greater than any of the preceeding 7 years. This exercised a retarding influence on the plant growth and especially on such characters as tillering and number of grains in the panicle which go to make up the yield.

Experimental work.—This may be divided into the following heads :— (1) Intensive study of the selected strains, (2) Replications, (3) Extensive cultures, (4) Further study of the old and new selections, (5) Study of F3, F2 and F1 generation of verious economic crosses, and (6) New crosses made this year.

(1) *Intensive study of the selected strains.*—In all, four strains, *viz.*, Nos. 42, 225, 226 and 227 were studied intensively. Six cultivator's samples in addition to the above were also grown in alternate plots of strain No. 42 for comparison. Four of these were continued from the last year while the remaining two were fresh additions. The selected strains have all given pretty normal frequency distributions except in the case of height and sterility, which is probably due to the uneven conditions and excessive rains.

The following statement would show their respective behaviours :—

Strain No.	Date of flowering	Total No. of bunches	Yield per plant in gram	Mean of the 2 alternate checks	Percentage difference in favour of strain No. 42
	Intensive Series, 1926-27				
Field No. 13					Per cent.
42/5 ..	6th October 1926.	225	28·91		
42/A ..	5th October 1926.	225	27·68	27·89	+ ·76
42/6 ..	6th October 1926.	226	26·87		
Wanjale ..	6th October 1926.	224	25·40	26·64	+4·88
42/7 ..	6th October 1926.	225	26·42		
Jambiwali ..	6th October 1926.	225	24·94	26·98	+8·18
42/8 ..	6th October 1926.	225	27·55		
Saphala ..	4th October 1926.	222	24·83	27·89	+13·32
42/9 ..	6th October 1926.	222	28·23		
Gowada ..	6th October 1926.	225	24·38	27·77	+13·90
43/10 ..	6th October 1926.	225	27·32		
Bhadas ..	24th September 1926.	225	21·54	27·43	+27·34
42/11 ..	6th October 1926.	224	27·55		
C. S. 1 ..	5th October 1926.	224	27·55	27·83	+1·
42/12 ..	6th October 1926.	225	28·12		
Field No. 15					
42/13 ..	6th October 1926.	223	26·64		
225 ..	7th October 1926.	222	26·14	27·04	+3·44
42/14 ..	6th October 1926.	225	27·44		
226 ..	6th October 1926.	221	27·90	26·76	−4·26
42/15 ..	6th October 1926.	225	26·08		
227 ..	6th October 1926.	222	24·00	26·98	+12·41
42/16 ..	6th October 1926.	225	27·89		
42/B ..	5th October 1926.	222	26·08	27·83	+6·71
42/17 ..	5th October 1926.	225	27·78		

It will be seen from this that the strain No. 42 has maintained its superiority over the different samples except perhaps No. 226 which has given slightly more yield than No. 42 in the intensive culture. It is worth noting however that this is not borne out in the replications and extensive and other cultures where No. 42 has given higher yields than No. 226. It is clear however from the last year's and this year's trials that No. 226 is almost as good as No. 42 in point of yield. Moreover it has also a slightly finer grain than No. 42 so that it may have a good prospect of being useful particularly in the Thana District where the people are keen about having a finer grain as it fetches better prices. No. 225 also follows closely No. 42 in yield and has got a good tillering and fine grain. It may therefore, be maintained in stock. No. 227 does not happen to be equally promising and may be rejected.

(2) *Replication.*—In all seven replications were made. They were as follow :—

No. of Replication	Yield of No. 42 from 100 bunches	Yield of sample compared from 100 bunches	Name of the sample	Difference in favour of 42	Ratio of difference to error in favour of No. 42	Remarks
	Grms.	Grms.		Per cent.		
1	3,641·50	3,178·33	Saphala ..	14	2·90 : 1	Most of the ratios are fairly significant.
2	3,903·08	3,411·16	Saphala ..	14	2·80 : 1	
3	3,785·08	3,547·16	Gowada ..	6	2·83 : 1	
4	3,694·33	3,562·00	C. S. 1 ..	3	2·50 : 1	
		New selections done in 1923				
	Grms.	Grms.		Per cent.		
5	3,719·08	3,441·33	No. 225 ..	8	2·64 : 1	
6	3,902·40	3,645·33	No. 226 ..	7	2·87 : 1	
7	3,517·91	3,055·50	No. 227 ..	15	3·07 : 1	

Note.—These comparisons were made by growing alternate cultures of No. 42 and some other strain or cultivator's sample. Thus there were seven cultures of No. 42 and six of the other samples alternating with each other. Each culture consisted of three lines, the distance between the lines and bunches being one foot. Each culture contained 75 bunches and each bunch carried 4 seedlings for want of sufficient stock. The distance between two cultures was two feet. The yields of two side cultures of No. 42 were added, halved and compared with the middle one in order to do away with the effects of soil irregularity.

It will be seen from the above statement that No. 42 maintains its superiority over all the strains with which it was replicated.

(3) *Extensive Cultures.*—These trials were made on about one guntha plot for each strain. No. 226 was grown in duplicate and in each case two plots of it were grown with one of 42 in the middle and the following results were obtained :—

Strain No.	Actual yield in lbs.	No. of bunches each containing 8 seedlings	Remarks
226	92	1,081	Averaging the results they work out to about 9 per cent. increase in favour of No. 42.
42	89	1,081	
226	71	1,081	
226	69	1,000	Averaging the results they work out to about 5 per cent. increase in favour of No. 42.
42	69	1,000	
226	63	1,000	

Again averaging the two results we get about 7 per cent. increase in favour of 42 which is also the increase obtained in the replications.

No. 42 was also grown in a two guntha plot, grown in bunches containing 10 seedlings each, where an actual yield of 161 lbs. was obtained which works out to 3,220 lbs. per acre.

Strain No. 79 was grown for multiplication in the warkas area where 68½ lbs. of seed was obtained, over 2 gunthas, working out to 1,370 lbs. per acre. The spacing here was 12 × 8 inches and each bunch contained 10 seedlings.

(4) *Further study of old and new selections.*—These were 50 in all, and belonged to four groups, *viz.* (1) Reserve Kolamba, (2) The old " New panicles ", (3) The bulk samples, and (4) The recent " New panicles ". In the first two lots, none were found to be promising. In the bulk samples two numbers, *viz.*, 326 an intermediate ripening and No. 329, a late one, seem to be more or less promising and they will be retained for the next year's trial. In the recent new panicles, three samples, *viz.*, 75, 78 and 80 seem to be promising and will be retained for the next year's trial. All the rest will be rejected.

(5) *Study of the Economic Crosses.*—F3 selection. The accompanying is, in brief, a statement of, and maximum and minimum values of, the important characters for which the selections have been done in F3 generation to represent the subsequent generations next year. In these selections, further indications are obtained to show that, earliness, fairly good yield and fineness have been combined. One thing may be noted, however, that the range of the variability in earliness is not as small as would be desirable, though many of the cultures began to flower as early as expected.

Name of the crosses	Generation under study	Total selections	Tillering, range	Time of flowering, range	Yield-range, grms.	Length of grain-range, mm.
39 × 164 (No. 10).	F3	28	5 to 10	5-9 to 22-9	10·00 to 37·50	6·62 to 7·72
No. 6 ..	F3	10	5 to 7	16-9 to 22-9	17·20 to 23·10	7·00 to 7·24
No. 12 ..	F3	12	5 to 8	14-9 to 22-9	16·10 to 26·00	7·04 to 7·36
Ko. 37 × 39 (15) ..	F3	9	3 to 9	28-9 to 5-10	12·80 to 38·50	6·70 to 7·74
(16) ..	F3	12				
39 × 121 ..	F3	2	6 to 7	5-10 to 7-10	24·90 to 26·30	7·04 to 7·20

Study of the F2 culture of the Cross 184 × 104 :—The cross was made in the year 1924-25 to combine high tillering, high yield, standing power and absence of sterility of 104 with the earliness and available fineness of 184. In the F2 generation this year 1,000 plants were studied. Lateness was found to be dominant to earliness. The ratio of late to early being 3·27 : 1. Indications have been obtained to show that earliness, fairly good tillering and fairly good yield have been combined. Selections have, therefore, been made to see how far this is going to be realised. There are very few cases of fine grain and good yield combined. The heavy rain of this year has however reduced the yield of these early selections in many cases as a lot of sterility has crept in.

More attention will be paid to securing standing habit in the next generation along with the other desirable characters. The following details state how many selections were made and give the maximum and minimum value of the important characters for which the selections have been done in F2 generation to represent F3 generation next year :—

Total selections	Tillering, range	Time of flowering, range	Yield-range, grms.	Length-of-grain, range mm.
29 ..	9 to 25	4-Septem. to 15-Octo.	31·00 to 68·00	8·00 to 9·14

F2 Culture of the Cross 184 × 104 of 1926-27.

Early Selections.

Plant No.	Date of flowering	Fineness in terms of length m. ms.	Tillers	Yield grms.	Remarks
531	19th Sept. 1926 .	8·34	21	42·10	Not inter sterile.
750	4th ,, ,,	9·12	14	41·20	End plant, not inter sterile, dark.
814	25th ,, ,,	8·14	21	41·50	Very inter sterile.
900	8th ,, ,,	8·66	17	49·60	End plant, slight inter sterile.
950	14th ,, ,,	8·58	14	45·10	End plant, slight inter sterile, dark.
589	11th ,, ,,	8·50	12	37·00	Slight inter sterile, dark.
596	22nd ,, ,,	9·14	12	34·40	Less inter sterile, dark.
644	18th ,, ,,	8·14	25	36·10	Not inter sterile, dark. Slender grain.
707	21st ,, ,,	8·88	11	33·20	Not inter sterile, dark, rather good.
731	10th ,, ,,	8·82	17	34·60	Do. do.
769	16th ,, ,,	8·80	16	33·00	Do. do.
783	20th ,, ,,	8·68	11	33·20	Do. do.
827	10th ,, ,,	6·66	9	32·60	Shedding, inter sterile.
909	11th ,, ,,	8·16	8	33·00	Inter sterile, dark.
996	21st ,, ,,	8·76	9	32·80	Dark.
478	21st ,, ,,	8·14	15	31·50	Dark, inter sterile.
848	13th ,, ,,	8·00	9	31·00	Even tiller dark, shedding.
922	14th ,, ,,	8·26	7	30·50	Dark, intering sterile.
691	19th ,, ,,	8·26	10	30·50	Do.
643	9th ,, ,,	8·94	10	30·50	Inter sterile.
673	19th ,, ,,	8·16	17	30·80	Dark, inter sterile.

Study of the F1 generation of the crosses No. 39×42 and 39×104 made last year is being continued.

(6) *New Crosses.*—The following new crosses were made :—

Cross made	No.	Seed obtained
Ratnagiri 21 × 39	5	1

It may be noted that " Ratnagiri 21 " does not produce as much tillering here as it does in Ratnagiri which may be seen from the fact that in cultures grown side by side. " Ratnagiri 21 " produced only 5·80 and 6·20 tillers per plant as compared with No. 42 which produced 5·85 and 6·02 respectively. Further No. 104, which is our high tillering strain under similar conditions, produced 6·99 tillers per plant. Besides there are also other disadvantages in " Ratnagiri 21 ", *viz.*, it has a very small panicle with few grains and also coarse and red coloured grain. Thus it will be seen that " Ratnagiri 21 " is not a desirable strain for crossing with Kolamba in the tract. As regards our present high tillering strain, *viz.*, 104, crosses have already been made with it, so that the results of these will be watched with interest.

Programme of the work for the next year

Intensive study.—Strains Nos. 225, 226 and 42 will be studied intensively and more detailed study of the promising selections Nos. 326, 329, 75, 78 and 80 will be made by growing these cultures alternately with No. 42 as usual and with the usual spacing.

Study of Crosses.—Further generation of the recent selections will be raised and 100 plants in each will be studied as in the last year. No further crossing will be attempted until the work in hand is brought to a successful conclusion.

Extensive cultures will be grown for multiplication of seed of Nos. 42 and 226.

Replications of the promising selections 326, 329, 75, 78 and 80 will be made for confirmation of their behaviour in the intensive cultures, if space is available.

Wheat

Locality and cultivation.—After the harvest of the previous crop, the wheat area at Ganeshkhind Botanical Gardens was given the necessary cultivation. In June Sunn hemp was sown and on attaining the flowering stage, it was ploughed in. Sowing of wheat was commenced on 22nd October 1926.

The progress of work, in the year under report, in the selection of seed and the testing of the selected strains as regards their purity and yielding capacity has been fairly satisfactory. This will be seen from

the fact that the work has now reached the stage of multiplication of seed. As regards the behaviour of these selections in the tract the reports received from Jalgaon, Shahada, Dhanduka and Nasik have confirmed the previous indications of the superiority of the selected strains over the locals of the different parts.

Early maturity and resistance to rust being factors of considerable importance are now receiving the necessary attention and the crosses made to evolve early maturing, rust resisting and good yielding types are giving promise of supplying the need.

Intensive study of cultures.—Fourteen pure selected strains were grown for intensive study of the purity or constancy of their important characters. But owing to unfavourable moisture conditions the germination of seed was defective and the growth of a large number of plants was retarded. There were, besides, many gaps. Resowing of seed and hand-watering of the weakened seedlings brought about very uneven conditions. This, combined with the rust-attack, which caused shrivelling of the seed, showed that the intended intensive study of the cultures would not be reliable. No apparent admixtures or hybrids were however found, and a general examination of the crop showed that the strains were practically pure.

Replications with the local.—Along with the fou teen pure strains, two others that were known to be high yielders were added, *viz.*, "Punjab 11" and "Punjab 8-A." These were also replicated with the local seed from Charoli as standard. All these years the selected strains used to be similarly compared with Pusa 4. Though the former are late in maturity by about ten days and more or less liable to rust as compared with Pusa 4, they were found to give as good yields as Pusa 4. The four strains 103, 167, 210 and 224 have given higher yields than the local this year also, although this was not expected owing to improper germination, uneven stand and a large number of gaps. Strain No. 162, however, which had particularly suffered this year did not show its usual superiority as the local which had a better start and a better stand naturally gave better results. The rust affected all the strains uniformly and the seed obtained was more or less shrivelled.

Of the new types, *viz.*, Punjab 11 and Punjab 8-A, only the latter, as will be seen from the figures given below, has given better yield than the local. Both these types are late in maturity by about 15 days and were affected by rust and as such will not be of very great use for the Deccan area.

At Manjri Kuran, where similar observations and experiments were laid, the very same strains have shown their superiority over the local.

The following table gives the total yield of the strains in the 15 and 18 lines respectively. Three lines of each strain were alternated with three lines of local in 5 replications and every strain was compared with the mean yield of the two checks on either side to cover the cases of any variation in the soil.

Comparative table of yields of the strains with local

Strain No.	Yield	Percentage of superiority over the local	Strain No.	Yield	Percentage of superiority over the local
	Lbs. oz.			Lbs. oz.	
103 ..	17 14	21·2%	171 ..	13 6	
Local ..	14 12		Local ..	13 6	....
224 ..	17 7	9·4%	212 ..	13 6	
Local ..	15 15		Local ..	15 7	....
Punjab 8A ..	15 6	12·8%	237 ..	13 15	
Local ..	13 10		Local ..	14 2	....
210 ..	14 14	1·3%	278 ..	13 1	
Local ..	14 11		Local ..	15 6	....
167 ..	14 4	0·9%	186 ..	12 13	
Local ..	12 2		Local ..	13 15	....
Punjab 11 ..	15 7	....	228 ..	12 12	
Local ..	15 11		Local ..	14 10	....
162 ..	15 10	....	52 ..	11 5	
Local ..	16 7		Local ..	12 11	....
168 ..	14 8	....	200 ..	8 3	
Local ..	14 10		Local ..	10 13	....

It will be seen from the above table, that strains Nos. 103, 224, Punjab 8-A, 210 and 167 have given better yields than the local. Of these strains Nos. 103, 167 and 224 along with 162 are the ones marked out as high yielders and are at present being distributed.

Crosses.—With the object of securing early maturing, rust resistant and high yielding types, importance is now being given to the study of crosses made in 1923-24. From the F2 generation of a cross of Khapli × 168 (rust resistant × early type) some early and rust resisting selections were made. In the F3 generation splitting has been observed and some types like the Bansi variety with greater rust-resistance and early maturity have been obtained. The material on hand, however, being insufficient and with an uneven stand, intensive study has not been possible.

From the F1 generation of the cross of Khapli × 167 and Khapli × 103 (rust resistance × high yielding) plants have been obtained and found to resist rust. The other crosses made with Pusa 4 have proved to be useless, inasmuch as they have been found to bring in considerable amount of sterility in their progeny. Besides as there is no resistance in them to rust, all of them have to be rejected. Satisfactory results, however, may be expected from the Khapli × 168, Khapli × 167 and Khapli × 103 crosses.

Ridge system.—To find out if this system, by giving better airation would have any effect on the control of rust the strains were grown on

ridges of 1½, 2 and 3 ft. width. The growth in the beginning was found to be vigorous, but rust eventually affected all the strains, including Pusa 4.

Reports from the District Agricultural Overseers.—Shahada :—The District Agricultural Overseer, Shahada, says "as compared with the local, the grains of the strains were plump and heavy in weight. Strain No. 162 seems to be high yielder and that should be spread. The strains were late in ripening by about a fortnight. There was no rust."

Dhanduka.—The District Agricultural Overseer, Dhanduka, says "strains Nos. 168 and 167 were tried both under dry and irrigated conditions alorg with the local of the place under similar conditions. The striking superiority of these was so remarkable that the District Agricultural Overseer held a demonstration for the purpose on the fields of Mr. Shah where the comparison was made. There was a large gathering and the cultivators were thoroughly convinced of the superiority of the strains. They ripened uniformly though were late than the local. The grains had good lustre and the yield was better than the local. There was no rust."

Jalgaon.—The Superintendent, Jalgaon Farm, says "sufficient trial is now given to the strains on the farm and only strain No. 224 is found superior in quantity and quality also. This is tried for the last four years and may now be tried on field scale. There was no rust."

Nasik.—Very satisfactory and encouraging report is received from the District Agricultural Overseer, Nasik. In the three different villages where strains Nos. 103, 162, 167 and 224 were tried, all have given higher yields than the local. Strain Nos. 162 and 224 particularly have been found to give very appreciably better results. Further multiplication and distribution is now in hand.

S. G. BHALERAV,

Crop Botanist to Government.

APPENDIX M

Annual Report of the Plant Pathologist to Government Bombay Presidency, Poona, for the year 1926-27

Charge.—During the year under report the Economic Botanist to Government held charge of this section of the Department until the 10th September 1926 when Dr. B. N. Uppal took charge.

Staff.—Mr. G. S. Kulkarni was appointed to the post of Plant Pathologist to Government, Bombay Presidency, from the 3rd September 1926, but was allowed to remain on deputation to the Indian Cotton Committee.

Dr. B. N. Uppal was appointed to the post of Assistant Professor of Mycology *vice* Mr. G. S. Kulkarni, and to act as Plant Pathologist to Government during the deputation of Mr. Kulkarni.

Mr. M. N. Kamat continued to act as Assistant Professor of Mycology *vice* Dr. B. N. Uppal.

Mr. J. S. Malelu continued to act as Assistant Mycologist *vice* Mr. M. N. Kamat.

Education

Beginning with this year, Advance Plant Pathology which includes mycology and advanced entomology, was made an optional subject for the B.Ag., degree course. The compulsory course in Plant Diseases was given as usual.

On account of the increased number of students and other activities of this section the teaching work has become heavy, and in order to be able to carry on this work without the least detriment to our research activities, it is very necessary to have a whole-time lecturer in mycology.

Research

Sulphur treatment for grape vine mildew.—As a result of certain work done in this Presidency, the Bombay Department of Agriculture recommended the practice of spraying the vines with Bordeaux mixture against the powdery mildew of grape. However, experiments made in this year have shown that the application of sulphur on mildewed vines is much superior to that of Bordeaux mixture, in effecting the control of the disease, in improving the quality of fruit, and in cheapness. The problem is still under investigation; but indications point to the conclusion that this new method of treating the vines with sulphur will put more money into the hands of the growers, as there is likely to be a net saving of about Rs. 35 per acre on the cost of treatment in addition to the other advantages accruing from the better quality of fruit. In order, therefore, to enable the growers to take advantage of this research, it has been decided to issue, as a preliminary report, Leaflet No. 6 of 1927 of the Bombay Department of Agriculture, entitled "Control of the Powdery mildew of Grape." It is also encouraging to note that some of the progressive growers have already taken on to this new

method of control and are giving no other treatment to their vineyards than the sulphur dusting.

This work has been done in co-operation with the Horticulturist to Government, who gave us all possible assistance, for which we tender our thanks to him and his staff.

Gummosis of Citrus trees.—Work on the control of this disease is being continued and the carbolic acid treatment has so far been very successful. Our laboratory assistants have now been properly trained in the technique of the treatment, and they have been doing very well in answering numerous calls from the orchardists.

Rhizoctonia on brinjals.—This is a serious trouble wherever brinjals (egg-plants) are grown. In some cases the crop is a failure. Attempts were, therefore, made to control the disease with corrosive sublimate (1 ounce dissolved in 10 gallons of water) applied around the bases of the plants. Since the trials were made when the plants had started to bear, no conclusions as to the success or failure of this method control could be drawn.

B. N. UPPAL,

Plant Pathologist to Government.

APPENDIX N

Annual Report of the work done by the Soil Physicist to the Government of Bombay, Manjri Farm, during the year 1926-27

Mr. V. A. Tamhane, M.Ag., M.Sc., I.A.S., Soil Physicist to the Government of Bombay, was transferred to Sind to take charge of the newly created position of Agricultural Chemist and Soil Physicist in Sind in connection with extension of Agriculture under Irrigation by the Sukkur Barrage Works, from 13th September 1926. The undersigned took over the charge of the work from the 25th November 1926. Mr. G. M. Bapat, M.Ag., was carrying on the duties from the 13th September to the 24th of November 1926.

The Problem.—The most important problem which is being investigated by the Soil Physicist for the last three years is the application of the well known methods of Dry Farming for the growing of crops on natural rainfall under very different conditions of soil and climate obtained in the Bombay Deccan, especially in districts of precarious or untimely rains and which are often subject to droughts and famines.

The year under report is the third year of experiments in the Rabi season, while, is only the second year for experiments of Kharip season. As the problem of Dry Farming is entirely dependent on the natural rains, the results obtained are to be studied and interpreted in the light of the nature and quantity of rainfall. Now taking the rainfall records of the three years, *viz.*, 1924, 1925 and 1926, we find that there are three distinct types of rainfall. The year 1924 with a total rainfall of 25·91 inches was distinctly a wet year, above the average rainfall at Manjri. The year 1925 had only 14·26 inches of rain and was therefore a bad year, whereas the year under report 1926 with 20·34 inches of rain is intermediate and is still slightly below the average, if only the total rainfall is taken into account. But the distribution of rainfall in 1926 indicates that the rains during the Kharip season were ideal and timely and enabled us to grow a very bumper crop of Bajri. But the late rains were not so good and the Rabi season was not therefore as good as that of the year 1924.

Experiments with Rabi-Jowar.—The same series of experiments with Rabi-Jowar as carried in the two previous years was carried out this year with modifications where necessary with the following objects :—

(1) To prevent the run-off of rain water as completely as possible,
(2) To provide for complete absorption of rain water by the soil,
(3) To check the evaporation of water from the soil and lastly,
(4) To increase the retentiveness of the soil for water to enable us to raise a crop of jowar on the stored water during the rains.

The methods of cultivation.—The actual operations carried out to achieve the abovementioned objects were as follows :—

(*a*) Deep cultivation of the land by ploughing the land deep with a heavy plough—9″ to 12″ deep followed by disk harrow and blade-harrow. This provides for the absorption of rain water.

(*b*) Levelling the plots and placing small bunds 9 inches high round small plots. This prevents the surface run-off of water especially during heavy rains.

(*c*) Constant stirring of the soil by a harrow or a hand-hoe. This prevents cracking of the soil and evaporation of water from the soil by the formation of loose mulch.

(*d*) Adding of green manure like Sann-hemp and Chaoli and also the ordinary Farm Yard Manure. This increases the retentiveness of the soil for water.

(*e*) One more experiment was tried to see whether water can be accumulated in furrows opened during rains and closed before sowing and thus make it available to the crop later on.

Yields of Jowar Crops

—	1924 Rainfall 25·91 inches (Good year) grain	1925 Rainfall 14·26 inches (Bad year) grain	1926 Rainfall 20·34 (Intermediate year) grain
	Lbs.	Lbs.	Lbs.
Plot I control (no bunds and 1 inch mulch ..	776	347	699
Bunds and 2 inches mulch	825	421	997
Bunds, Sann Green Manure and 1 inch mulch.	1,136	256	969†
Bunds, Farm Yard Manure and 1 inch mulch .	....	119	992†
Bunds and previous year's Green Manure and 1 inch or 2 inches mulch (Residual effect) ..	....	417	*1,330†
Bunds, Furrows kept open during rains and closed before sowing and 1 inch mulch ..	....	553	998†

* This plot had received ashes obtained by burning Sann to the extent of 480 lbs.

† During this year's experiments 2 inches mulch was maintained on all these plots as it was found to be most effective by trials of the previous two years.

Experiments with Rabi-Jowar.—All the above experiments were carried with the Rabi-Jowar and the comparative results for the Rabi-Jowar of three years indicate how, far the rainfall controls the yields under different treatments. The experiments were carried in triplicate plots of one guntha each and the results given are calculated on acreage basis from the average results of the triplicate plots excluding ring plots. In the case of Rabi Jowar the seeds are sown 18 inches each way. This not only secures sufficient moisture for the complete maturity of the plant but facilitates interculturing with a planet junior-hand hoe till the crop comes to maturity.

Results obtained so far.—The comparison of the yields of the three years is very interesting.

(1) As far as the control plot is concerned the results represent the character of the season. The year 1924 with the highest rainfall has given the highest yield, the year 1925 with its lowest rainfall has given the lowest yield, while the year 1926 with an intermediate rainfall, has an intermediate outturn.

(2) But when we come to the other treatments the results are entirely different. For example if we take our standard treatment of bunding and 2 inches mulch we notice that the increase in yield over the control is only 6·3 per cent. in 1924, but is 24·2 per cent. in 1925, while it is 42·6 per cent. in 1926.

(3) If we compare the results obtained by the addition of green manure we find that in a heavy rainfall year it has given marvellously good yield *viz.*—nearly 46·0 per cent. increase over the control, while in a bad rainfall year there was a decrease in yield of about 26·0 per cent. below the control—plot, while the year 1926 again indicates an increase of nearly 42 per cent. over the control plot.

(4) The addition of Farmyard Manure in the year of scanty rainfall has resulted in almost a crop failure, having given only nearly one-third the yield of the control plot, while in an year of intermediate rain though the yield appears to be good if compared with the control plot there is no advantage over a bunded plot with 2 inches mulch with which this is really comparable.

(5) There seems to be a distinct residual effect of green manure in the following year of application. This is more obviously seen after a year of scanty rain when there is not enough rainfall for the proper decomposition of the green manure. In the year 1925, the plot treated with Sann green manure in the previous year, gave an increase in yield of about 20·0 per cent. over the control plot or nearly an increase of about 30·0 per cent. above a bunded plot with one inch mulch with which it is comparable.

More striking is the result in the year 1926 on account of nature of rain in the previous year when the green manure was added and probably escaped decomposition. The increase in yield of this plot is nearly 90·0 per cent. over the control plot and at least 33·0 per cent. over a bunded plot with two inches mulch.

(6) Lastly the effect of opening furrows during rains to accumulate water and closing them before sowing depends entirely on the nature and time of rainfall. If there is fairly heavy rain so as to accumulate water in the furrows just before closing them as happened in the year 1925, there is a decided increase in the yield of the crop. Thus in this year of 1925, there was an increase in yield amounting to nearly 59 per cent. over the control plot or nearly 72·0 per cent. over a bunded plot with one inch mulch. But in the year 1926, the increase over the control amounts to nearly 43·0 per cent. but if compared with bunded plot with 2 inches mulch the results are almost identical.

Provisional Conclusions.—The discussion of the results given above brings out very strikingly the following provisional conclusions :—

(1) If no special treatment is given to the land such as, levelling, bunding and stirring the upper surface soil to 2 inches the yields are entirely proportional to the quantity and nature of the rainfall of the year.

(2) It is possible to increase the yields of jowar crop by methods of cultivation to the extent of 25 to 40 per cent. These increases are more marked in a year of scanty rainfall than a year of a good rain.

(3) The addition of green manure increases the yield by over 40 per cent. in a year of good rainfall. In a year of scanty rain the result is bad no doubt but this lowering of yield in that year is compensated by an increase in yield in the following year due either to decomposition and thus making plant food more available to the following crop, or due to its improving the physical condition of the soil in such a way that it makes more water and plant food available to the crop.

(4) The addition of Farm Yard Manure must be done with great care in the method of Dry Farming, as the addition of a large quantity of a Farm Yard Manure in a year of scanty rain may result in a crop failure, while in a good year the result is only equal to good cultivation.

(5) Judicious and timely opening and closing of the furrows may result in conspicuous increase of crops in a scanty rainfall year, though in a good year the result may not be obvious.

Experiments with Bajri-crop.—The other crop which is grown by the application of the methods of Dry Farming is Bajri (Pennisetum Typhoideum) grown during the Kharif season. This was only a second year for the Bajri crop and the season was entirely different. The year 1925 was a bad year on account of quantity and distribution of rainfall. But the year under report, *viz.*—1926 had a rainfall nearly 42 per cent. higher than that of 1925 and the distribution of rain was simply ideal for Kharif season. There were no heavy showers causing run-off or washing away of the soil and came at the critical periods of the crop growth. This good distribution coupled with the thorough tillage and cultivation of the soil enabled us to obtain a far greater outturn than is usually obtained by raising a crop on rains alone.

The following comparative results will be found interesting as they indicate the great influence which the seasons have on the crop outturn :—

	1925 Rainfall 14·26 inches		1926 Rainfall 20·34 inches	
	Yield of grain	Yield of straw	Yield of grain	Yield of straw
	Lbs.	Lbs.	Lbs.	Lbs.
No bunds 1 inch mulch	365	996	1,372	2,424
Bunds and 1 inch mulch	415	871	1,310	2,613

It will be seen that the yields in 1926 are nearly three times the yields obtained in the previous year, *i.e.*, 1925 though the rainfall was only 42 per cent. higher.

The second series of experiments designed to find out most suitable distance for planting the Bajri crop has shown that under the rainfall conditions obtained this year, 3 inches distance between plants, was the most advantageous when the distance between the rows was 18 inches whereas under conditions of rainfall of the last year thinning to a distance of 6 inches was more favourable—

	1925 Yield of grain Lbs.	1926 Yield of grain Lbs.
Thick Sown	.. 676	1,615
Sown at a distance of 3″ ..	.. 588	1,870
,, ,, 6″ ..	.. 748	1,613
,, ,, 9″ ..	.. 737	1,644

When we take into account that the normal outturn of Bajri in this part of the Deccan is only 340 lbs. per acre, the yields obtained at the Dry Farm Station even during a year of scanty rain are certainly encouraging while the very large outturn during a good year of rain indicates the great possibilities of increasing the present precarious outturn obtained by our cultivators at least on lands which are classed in the revenue survey as 10 annas lands.

Some of the important experiments with Rabi jowar tried at the Dry Farming station at Manjri were repeated at Mohol in the Sholapur District which is situated in the heart of a district which is liable to periodical famines, and hence the results obtained at this place are important. The experiments carried at Mohol cannot be very elaborate in the absence of a special man to look after the experiments. They are carried by the courtesy of the Deputy Director of Agriculture, South Central Division, by the Agricultural Overseer at the station in addition to his other duties.

Results obtained at Mohol with Rabi-Jowar

—	1925		1926	
	Yield of grain	Yield of straw	Yield of grain	Yield of straw
	Lbs.	Lbs.	Lbs.	Lbs.
No bunds and 2 inches mulch ..	784	1,360	420	1,280
Bunds and 2 inches mulch ..	840	1,360	700	1,600

Here again the advantage of bunds over no bunds is seen in both years, but it is more obvious in 1926, as the distribution of rainfall was bad. In the month of September 1926 in one week from 9th to 16th the total rainfall received amounted to 12·09 inches, nearly two-thirds of the total rainfall of the whole year; the result was, that a large portion of the rain water was lost by run-off from the unbunded plot while the bunded plot could accumulate and retain more water which became available to the crop.

On the whole these experiments at Mohol confirm the very promising results obtained at the Dry Farm Experimental Station at Manjri.

Laboratory Work.—A great deal of Scientific Laboratory work still remains to be done. Numerous determinations will have to be made in the laboratory and by means of pot-culture experiments before the methods of Dry-Farming are settled on a broad scientific basis. Unless funds are forthcoming to engage more hands and purchase some apparatus, no great progress in the laboratory work seems possible. In view of the great importance of the problem which affects agriculturally important districts of the Bombay Deccan, it is hoped that funds would be made available in the very near future to enable the Soil Physicist to solve one of the most urgent and important problems in the Deccan.

Staff and Accommodation.—Mr. G. M. Bapat, M.Ag., who is the only graduate Assistant has put in a very hard and conscientious work during the year under report. On account of the absence on leave for the three months and subsequent transfer of Mr. V. A. Tamhane, the burden of laboratory and field work fell on Mr. Bapat for nearly six months, which was carried to the entire satisfaction of all concerned. The Director has ear-marked a sum for the construction of quarters of Mr. Bapat, this year, and it is hoped that he would be accommodated in comfotable quarters before the time of the next annual report.

The non-graduate fieldman still continues to be temporary even this year and it is hoped that the post is sanctioned during the next financial year as it is strongly supported by the Director.

N. V. KANITKAR,

Soil Physicist to the Government of Bombay,

Manjri Farm.

APPENDIX O

Summary of Work done by the Live Stock Expert to Government for the year 1926-27

Charge.—Mr. E. J. Bruen was in charge of this section of the Department for the whole year.

Propaganda.—The Live Stock Expert and his staff carried on propaganda work in teaching by lectures and ocular demonstrations at Shows, the utility of breeding better cattle and the methods of feeding and better breeding. Such propaganda is now beginning to show results, as is seen from the very numerous inquiries and requests for help coming in from the districts.

The request and demand for bulls now exceeds the supply, both for bulls raised on Government farms and for those breeds, for which, bulls are still being purchased. It has been the policy of the Department to concentrate in certain areas. During the year under report, these areas have been extended in East Khandesh and North Sind Frontier. The areas now covered comprise the whole of Gujerat, East Khandesh, Sholapur, Satara, Belgaum and Dharwar Districts, with fair propagarda being carried out in the suburbs of Bombay City, the object here being to try and get the Bombay City milk supply produced in the mofussil. The progress is necessarily slow but the results so far obtained are fairly sound. The work in Sholapur and Satara Districts is now getting difficult as desirable bulls are scarce and moreover very expensive. After visiting four large recognised cattle fairs, only two suitable bulls could be purchased. During the year 67 bulls were put out either as Premium Bulls or Breeding Bulls.

Sheep.—The small sheep experiment conducted in co-operation with Rao Saheb S. S. Mangsoli is now claiming fair attention and several inquiries have been received from professional sheep breeders. It is interesting to note that even the ignorant sheep breeder appreciates the quality of the wool now produced by Rao Saheb Mangsoli, and better prices are offered even by these people for weaving blankets. There is also a demand for his male stock.

Poultry.—With the starting of the Bombay Presidency Poultry Association, initiated by Dr. Harold H. Mann, great interest has been aroused in poultry farming as a subsidiary occupation. Numerous inquiries are being attended to daily. This industry is being taken up by all classes and communities. It was soon realised that to get the best out of the industry, that, better markets must be found or created. With this object in view, both the production and marketing have been taken up simultaneously. The inquiries already received for better poultry for the table from some of the large users in Bombay promise very well for the industry and should this be established together with better marketing and transport arrangements, a very promising subsidiary occupation will be established to the very great benefit of our poor classes of agriculturist.

When a sufficient supply is forth coming, it will not be a very big matter for India to bid for the very great import trade of Great Britain's egg supply, which at present is met to a great extent by China.

Poona Show.—A great deal of the time of this section and its staff was concentrated on the last Provincial Agricultural Show. It is felt that the extra work entailed and the time spent was well worth the trouble. The opportunity offered was taken advantage of, by showing to the Presidency the types of cattle now in use in the Presidency and the results obtained in villages from well bred bulls. It was acknowledged by all that the Government cattle exhibited were the best ever seen. Great credit is due to the Managers of farms and the Divisional Inspectors for the very fine display.

Staff.—The entire staff under my control worked exceedingly well. The great demand made on them for the Show made no material difference in the District work. Mr. D. S. Patel, Divisional Inspector of Cattle Breeding, N. D., gave me great help in the work undertaken in and around Bombay. My entire Office staff had to put in extra time owing to the Show, which they did willingly and well.

General.—I should here like to make special mention of the very valuable help given to this section by Mr. Motilal Kanji Kapadia, J.P., and Rao Saheb Harjivan Valji, J.P., of Bombay, Mr. L. S. Potnis, Mamlatdar of Bhusawal, and Rao Saheb S. S. Mangsoli of Athni, who have worked willingly in the interests of the cattle improvement of the Presidency.

Northcote Cattle Farm, Chharodi (District Ahmedabad)

(For the Kankrej breed)

Staff.—Mr. M. M. Desai, B.Ag., held charge of the farm during the year with the exception of 22 days by Mr. V. G. Desai. Mr. M. G. Patel, B.Ag., was Assistant Manager throughout the year except for six weeks whilst officiator for the Manager, Willingdon Cattle Farm, Phihai (Sind).

Season.—The year was exceptionally hot and the agricultural season rather late. During the months of April, May and June, the cattle suffered owing to extreme heat.

With the exception of a few cents of rain during the last week of June, the farm had no rain since September 1925; uptil the 1st week in July the farm recorded a deficit of four inches as compared with the previous year. On the 9th July the farm recorded one inch of rain with a break of four days, which helped to start sowing operations. Between the 13th and 15th July six and a half inches of rain were recorded, which stopped further sowing operations until the 19th July. The total rainfall recorded was 54 inches and 40 cents., *i.e.*, 24 inches and four cents. more than the previous year. This abnormal rainfall attracted swarms of flies and mosquitoes, besides doing considerable damage to grass and other crops.

Hay-Making.—Owing to the adverse conditions prevailing, the grasses had a bad set back. Ensilage-making, which is usually completed by

the end of August could not be started until the end of September. Hay-making operations were started on the 8th October 1926 and completed in the field on the 7th December 1926.

During the year 1926-27 new mowing machines were purchased with very gratifying results. The hay being cut at the right time is of good quality, moreover, the yield has increased considerably. In the year 1923-24, it cost the farm Rs. 5-3-7 to cut, cart, bale and stack its hay; this has been gradually reduced and this year it has cost only Rs. 1-15-3 per 1,000 lbs. for all operations. The yield of grass has increased considerably over 12 lac pounds being harvested as against 10 lacs, the best recorded so far. There is no doubt that the use of mechanical mowing machines and hay rakes is not only economical but the quality and quantity of the outturn is considerably increased. Over and above the 12 lac pounds of hay harvested, three and half lac pounds of silage was made. The work and such results are not possible with hand labour.

Breeding Herd.—The policy of breeding as originally adopted is being continued, that is, to produce a typical pure bred Kankrej of the dual type, giving both milk and draught.

Those animals not conforming to the type required are gradually being disposed of with a result, that the animals now being milked are increasing in yield. In the year 1922, the farm had six animals giving over 1,500 lbs. of milk, today the farm has 28 such animals. This yield is very encouraging, when it is considered that the animals are not stall-fed, are milked in the open and are at the same time suckling their calves, which is of first importance on the Chharodi Farm.

The early maturity factor so essential to us in India has again improved with breeding. The animals calving for the first time this year dropped their calves on an average of four years and six months as against four years and nine months of the previous year. Three of the above animals calved under three years and six months of age. This advance is considerable, when we compare the results of these with the age of calving in 1919, which averaged about six and half to seven years. This factor will be appreciated, when it is considered that such animals only cost half what their mothers cost to bring to maturity.

During the year 116 cows were brought under the milk test.

Several of the cows calving for the first time have yielded over 3,000 lbs. of milk and one has yielded as much as 4,229 lbs. in a lactation. There is no doubt whatever, that there is milk in the Kankrej breed and it will not be long, when this breed will equal if not surpass the Sindhi as a Dairy animal. Given further facilities of stall-feeding and milking, great results could be had from this breed.

The Farm again this year has not had any contagious disease and it is safe now to surmise that this is entirely due to two points:—

(1) Serum Simultaneous Inoculation against Rinderpest.

(2) Controlled water supply; ever since the Farm has pumped its own water, we have had no epidemics of any description.

The casualities on the Farm have reached a minimum.

During the year, the farm disposed of 168 animals of all description.

During the year 28 bulls were sold, 19 on the Premium System and nine for prices exceeding farm book value.

The cattle exhibited from the farm at the Poona Show attracted great attention.

General.—The results of the farm for the year are very encouraging. The farm staff all worked well without exception during a very trying year.

Willingdon Cattle Farm Phihai, Sind

(For the Sindhi breed)

Staff.—Mr. B. B. Jamaspjina managed the farm for the year, some part of the time single handed without clerk or fieldman.

Season.—From an agricultural point of view, the season was very fair. The farm however, suffered badly from a flood, and again later by two visits of locusts. During the month of July, extreme heat was felt which gave the livestock a bad set back.

Hay-making.—It is not possible in Sind to make hay each year owing to having no rain, but the year under report owing to the flood and fair rain, which did damage to buildings, produced a fairly good crop of hay. During the year 2½ lac pounds of hay were made at a cost of Rs. 7-5-3 per 1,000 lbs. stacked.

Cultivation and Irrigation.—During the year under report, a further 12 acres of desert land was reclaimed and brought under the plough. The farm has now 37 acres of land under cultivation. The farm is now growing the following crops :—

Jowar, Maize, Bajri, Guar, Berseem, Lucerne, Oats, Wheat, Nagli and Elephant grass with a small plot of Kikuyu grass for pasture.

All the above are excellent fodder and grow readily producing fair outturns. During the year 1,880 lbs. of lucerne hay was made, which is equal to any lucerne hay made in any part of the world. Oat and wheat hay was made both of the above are relished by the cattle. The Elephant grass is becoming quite popular, sets being supplied from the farm to 3 Zamindars and 3 Government farms.

In Sind, roughages are an unknown quantity in cattle breeding and Dairying owing to the scarcity of hay.

The Willingdon Cattle Farm has proved that with the making of Jowar, Oat and wheat, and lucerne hay, and permanent crops of lucerne and Elephant grass with a seasonal crop of Berseem, a cattle farmer can produce all the dry and green fodder, he requires for successful Dairy farming.

Land Development.—The farm at present has only one well and it is feared that the capacity of the well has been reached. The grazing land is receiving attention and the land is being cleared of kundu bush. The under-growth was cleared and burnt, which gave the cattle further grazing.

The great draw back to the farm is adequate fencing. There is no doubt that the only type of fencing useful in this humid salt atmosphere is a live fence. Wire fencing is of no value as it is ruined in a short while. It will take time, but it is hoped that the farm will in time be entirely fenced with a live fence, which will also act as a wind break for the crops.

The Breeding Herd.—The objects of the farm as mentioned last year and the policy laid down is being continued. The Sindhi breed, the best known Dairy breed in India has a naturally bad udder, being bunched up and pendulous, it is easily harmed. To obtain a good uniform udder is one of the objects of the farm, *plus* high milk yield, early maturity and regularity of calving. The udder development will take time.

The enclosed records (*vide* Statement "A") of farm bred animals speaks for itself regarding the increase of milk and the constant annual yield per animal. The annual yield however, may be misleading and the second Statement (*vide* "B") of yields per day over a total period including dry, gives a fair indication of what the breed is worth. These figures go to show what breeding and feeding will do in a herd. These figures are very gratifying, when it is taken into consideration that the cows are suckled by their calves.

The farm is now trying out seven different bulls to ascertain their breeding qualities. It is not until the third generation can we expect results, with all this the progress in the milk yielding capacity of the herd is increasing rapidly.

During the year 11 bulls were sold, 3 of these as Breeding Bulls and 8 sold at a figure higher than the book value. The farm now has 8 high yielding families, each possessing some desirable quality and all high milkers. By selection and breeding between these families, it is hoped to obtain a pure strain possessing all the qualities so desirable in a good commercial milking animal.

The work still before the farm and of a very urgent nature is the udder development. As breeding progresses, the escutcheon is becoming prominent, peculiar body marking and throw backs in colour are appearing; all these need very careful study and will have to be watched carefully. Then there is the present prejudice against the breed for draught purpose. The farm bred males are eagerly sought after already for this purpose and it is hoped that the farm will soon prove the Sindhi to be equal to any for working.

The Willingdon Cattle Farm cows and bulls shown at the Poona Show attracted much attention and very large prices were offered and refused. There is no doubt that at the Willingdon Cattle Farm, the foundation has been laid for the making of a really first class herd and if kept up, will in time, make the Sindhi world famous.

Propaganda

(1) Free service of farm bulls was given to outsiders, repeated requests in themselves show that this is appreciated.

(2) Help in selection and purchase of cows to other Provinces and foreign countries was given.

(3) Seeds of wheat, lucerne and Elephant grass were obtained and distributed. Mechanical help was rendered to neighbouring farms.

General.—The Manager, Mr. B. B. Jamaspjina has done well in a very trying year. For a long period he was houseless and had to live away from the farm, but with all this, he has shown really good results.

Cattle Breeding Farm, Bankapur (District Dharwar)

(For the Amrit Mahal breed)

Staff.—Mr. A. B. Gadagkar, G.B.V.C., held charge of the farm for the entire year.

Season.—The season was very fair for fodder growing, the rains being both sufficient and received at the right time, with the exception of a fairly long break towards the end of the monsoon.

Hay and Silage.—The outturn of grass both for silage and hay-making was better than the year previous, $2\frac{3}{4}$ lacs lbs. of grass being made into silage as against 92,118 lbs. last year. From the new area acquired this year permanently by the farm, 160,500 lbs. of hay was made. The land now provides sufficient fodder and grazing for the cattle. Unfortunately owing to the land being very rough, very little use can be made of mechanical power on this farm, and moreover the carting charges for the hay over a distance of 12 miles is costly. The grass lands are gradually being cleared and levelled and it is hoped soon to be able to reduce costs of harvesting considerably. Gradually more land is being brought under cultivation.

Livestock.—The herd has gradually increased to a strength of 180 cattle on the farm at the end of the year. It is now not possible to increase the herd and drastic cutting and selling will have to be resorted to annually to keep this figure constant. The land will not carry any more animals.

The propositions before us at the farm are: True to type animals, good draught, early maturity, regularity in calving and increasing the milk yield of the individual cow.

As regards type, progress has been made especially in the female stock; the male stock are still wanting in uniformity. To overcome this a pure bred Kangyam bull of known breeding is now being used, it differs in type from the Amrit Mahal but it is hoped to fix the colour by using this breed, size and stamina are improving. As regards early maturity Statement (C) speaks for itself. The original herd purchased calved at an average age of six years, and from the Statement attached, it will be seen that farm bred animals will calve under four years of age and some at three years and six months. Regularity of calving is shown in Statement (D), of the 12 cows shown, it will be seen that the maximum results of a calf per year have almost been reached. As regards milking, this breed is seldom, or never milked in its own home, Statement (E)

will show what has been achieved. It is hoped in another generation to produce a bull that will impart to its progeny milk sufficient for the breeder's home use.

The progress on all essential points is very encouraging. During the year six bulls were sold on the Premium System. Over and above this 68 cows of private farmers were covered by farm bulls.

Buildings.—As reported last year, the original buildings provided on the farm were to deal with a herd of 20 cows. Now that he herd is 180, the necessity for more accommodation for staff and livestock is keenly felt. Again this year, a shed to accommodate 50 cattle had to be erected.

Water Supply.—The question of the water supply has at last been solved, and before this report is printed, the new scheme will be in full working order.

Poona Show.—The cattle brought to Poona from this farm especially attracted the attention of His Excellency the Governor and the Royal Commission on Agriculture. Great credit is due to Mr. Gadagkar and his staff for the condition, in which the Bankapur cattle were shown.

Bombay Gowrakshak Mandali

Kandivalee Gowshala.—Government in co-operation with the above Mandali are breeding the Gir breed of cattle. This breed is most probably the most popular of the cow breeds in the Presidency. The object of the farm is to breed a pure type of Gir, possessing the desired qualities of an economical and useful animal. Early maturity, regularity of calving and high milk yield, combined with the physical requirements of a good draught animal are the objects in improving this breed. Bulls from such stock will be placed in villages to improve this breed in the villages.

Livestock.—The farm was started with 40 head of cows and one breeding bull. The herd now comprises 121 head as against 92 of last year, the Gowshala authorities adding 8 new cows to the herd during the year. The male stock on the farm now stands at 36 head as against 24 last year. A number of these will be fit ready to go out into villages by the end of the year. Two bulls were placed out this year.

Milking Herd.—The individual milk yield per lactation has gradually increased from 2,052 lbs., 2,386 lbs. to 2,660 lbs. during the year under report. These cows all suckle their calves. The increase is very appreciable and the standard required for an economical animal is not very distant. The farm at present cannot be said to be self-supporting, but when the increased value of the herd is considered, the balance is on the right side.

Land.—The Gowshala authorities are very keen and anxious that everything possible be done to improve this breed. No pains or expenses is spared to meet this end. During the year the grazing land was completely fenced as instructed by the Economic Botanist, the object being to get the best out of the grazing and hay cutting areas.

Silage.—During the year, the Gowshala made 461,450 lbs. of silage at a total cost of Rs. 516, the rent of land not being taken into account. General opinion had it that silage could not be made in heavy rainfall tracts, this attempt, however, had clearly proved that silage can be made and made very well at a very low cost. The condition of the cattle has greatly improved, getting such food in the dry hot months of the year.

Shows.—The Gowshala again held its annual cattle show and is attracting now more and more attention each year. The quality of cattle shown was a decided improvement on previous years.

The Gowshala were very successful with their cattle at the last Presidency Agricultural Show, Poona, having won medals and highly commended certificates in open competition with other breeds of the Presidency.

General.—The Hon. Joint Secretaries have put their heart and soul into this project and with encouragement will, I know, spare no pains to bring the Gir breed to the fore-front.

Nathoo Lalji Charity Trust Fund

Mulund Gowshala.—In co-operation with the Government, this institute is doing similar work as the Kandivalee institute, the Gir breed being maintained with the same object. The Trustees Mr. Motilal Kanji Kapadia and Mr. Jetha Virji are very keen and enthusiastic.

The situation of the farm is not quite so good as Kandivalee, being very malarious, the staff including the Manager have suffered considerably. In consequence the work has not progressed as it should have done.

In addition to the breeding experiment, the farm is trying out 3 or 4 species of grass to ascertain their value as green fodder in such tracts. Owing to frequent interruptions, this work also has suffered. It is, however, hoped that some useful data will be forthcoming during the current year.

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

STATEMENT A

Willingdon Cattle Farm, Phihai, Sind

Serial No.	Name	Yield lbs.	No. of calf due	Remarks	Name of Dam	Highest yield of Dam lbs.
1	Sonni ..	4,991¾ 4,140 6,654 5,931½	5th ..	....	Karachi ..	5,014¼
2	Matari ..	5,647¼ 5,157¾ 5,570 6,771¾	5th ..	....	Karachi ..	5,014¼
3	Mochari ..	5,152¼ 2,392¼ 3,636¼ 4,236½ 2,808¼	6th ..	No dry period in between. Lost one teat during previous lactation.	Soomal ..	1,748 (One teat only).
4	Sugni ..	4,944½ 4,156½ 4,350¼ 3,795½	5th ..	....	Seeyani ..	3,729¼
5	Sajani ..	5,708¾ 5,672¾	3rd ..	....	Seeyani ..	3,729¼
6	Mariam ..	4,315½	1st ..	Still milking ..	Thul ..	4,078
7	Soji ..	2,461½	1st ..	Bidding well, still milking.	Sugni ..	4,944½
8	Mussoorie ..	2,000	1st ..	Bidding well, still milking.	Mandhir ..	6,501¾

E. J. BRUEN,

Live Stock Expert to Government,

Bombay Presidency, Poona.

STATEMENT B

Willingdon Cattle Farm, Phihai, Sind

Serial No.	Name	No. of lactation	Average including dry period	Remarks
1	Bhangrio II	2	10· 4	Farm bred.
2	Bhanjari	4	10· 9	
3	Daisy	4	13· 5	
4	Gulmohor	4	10· 5	
5	Indra	2	17· 5	
6	Irravadi	3	12· 1	
7	Jasmine I	4	10· 9	
8	Kanir	4	12· 6	
9	Kotri	2	12·25	
10	Lakhi	3	12·75	
11	Mandhir	3	12· 9	
12	Matari	4	13· 8	Farm bred.
13	Moar	4	10· 4	
14	Mochari..	5	10· 2	Farm bred.
15	Thar-Nerbuda	3	9· 8	
16	Pipri	2	14· 6	
17	Sajani	2	14· 4	Farm bred.
18	Sonni	4	12· 1	Do.
19	Sugni	3	12· 8	Do.

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

STATEMENT C

Cattle Breeding Farm, Bankapur (District Dharwar)

Serial No.	Brand No.	Date of birth	Date of service	Age at which served		Remarks
				Y.	m.	
1	90	6th November 1922 .	24th April 1926 ..	3	6	
2	92	19th December 1922 .	1st September 1926..	3	10	
3	94	30th January 1923 ..	24th January 1927 ..	4	0	
4	95	1st February 1923 ..	18th November 1926.	3	9	
5	98	9th March 1923 ..	18th November 1926.	3	8	
6	99	11th April 1923 ..	10th November 1926.	3	7	
7	104	1st February 1924 ..	24th January 1927 ..	2	11	
8	109	5th August 1924 ..	5th December 1926 .	2	4	
9	112	14th December 1924 .	14th January 1927 .	2	1	

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

STATEMENT D

Cattle Breeding Farm, Bankapur (District Dharwar)

Serial No.	Brand No.	Name	Total number of years that she is on the Farm	No. of calves thrown
1	9	Koyana ..	7 years ..	6
2	15	Tapi ..	7 ,, ..	7
3	16	Tunga ..	7 ,, ..	5
4	19	Nira ..	7 ,, ..	6
5	20	Amba ..	7 ,, ..	6
6	28	Bhavani ..	7 ,, ..	4
7	37	Aditi ..	6 ,, ..	4
8	38	Devaki ..	6 ,, ..	5
9	41	Uma ..	6 ,, ..	4
10	42	Pramila ..	6 ,, ..	4
11	44	Dropadi ..	6 ,, ..	4
12	49	Ahallya ..	6 ,, ..	5

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

STATEMENT E

Cattle Breeding Farm, Bankapur (District Dharwar)

Serial No.	Name of cow	Brand No.	No. of days milked	Quantity yielded Lbs.	ozs.	Date commenced	Date dry
1	Urvasi	80	241	1,396	10	1st April 1926 ..	6th Dec. 1926.
2	Bharati ..	86	270	1,030	8	Do. ..	31st Dec. 1926.
3	Kumudini ..	37	224	1,272	6	Do. ..	14th Nov. 1926.
4	Hanavati ..	68	193	839	6	13th Sept. 1926 ..	Continued.
5	Saudamini ..	74	181	1,071	2	30th Sept. 1926 ..	Do.
6	Ushya	88	86	377	4	5th January 1927 .	Do.
7	Nira	19	86	602	0	Do.	Do.
8	Chalvi	39	56	388	12	1st April 1926 ..	Sold.
9	Shiddi	9	30	61	14	5th January 1927 .	Continued.
10	Solabeti.. ..	87	14	69	10	28th Nov. 1926 ..	Do.
11	Harnibeti ..	100	51	174	0	9th Feb. 1927 ..	Do.

E. J. BRUEN,
Live Stock Expert to Government,
Bombay Presidency, Poona.

APPENDIX P

Summary of Work done under the Agricultural Engineer to Government, Bombay, Poona, for the year 1926-27

I held charge of the office during the year under report. This is the 17th Annual Report of the Agricultural Engineering Section of the Agricultural Department and the work was of a much more strenuous nature than past years due to the great Presidency Agricultural Show held in the Agricultural College grounds, Poona, in October 1926 of which the undersigned was the Joint Secretary for the Implement and Machinery Court, the Tractor Court and the Water Court, in addition to his own duties as Agricultural Engineer. The Show work was in full swing from the beginning of July 1926 and continued so until well on into November. All the important members of my staff and the Workshop had to work hard and put in long days for weeks in order to get things ready. In short this additional work lasted for a period of six months and the success of my Section of the Show was made possible by the able assistance and hearty co-operation of the whole of my staff. The principle work involved in this connection can be briefly stated as under :—

(1) Correspondence with the General Secretary and exhibitors in connection with general information regarding the Show such as the designs and types of booths, the conditions under which the exhibitors could take part and many other details regarding concessions, etc.

(2) Show account for money spent in the many branches of the work.

(3) Freight of nearly 300 tons of machinery from and to railway station including loading and unloading.

(4) Supply of water to the several booths, for prime movers and lifts and necessary assistance to the exhibitors regarding erection of machinery and dismantling.

(5) Making preparations for the booths and listing of exhibits and giving technical description for inclusion in the Show Guide with translation in vernacular.

(6) Getting the Water Court ready for the Show with various Lifts and Machines, including testing and fixing.

(7) Testing of wells for water-supply in the Show Ground and getting pumping plants fixed for drinking purposes.

I now turn to my own legitimate work, which is briefly summarised under the following heads :—

1. Experimental.
2. Advisory.
3. Executive.

Experimental

The modification of Implements on Agricultural Machines :—Further improvements on the Winnower made by Messrs. Penny and Porter, mentioned in the last report were completed and the improved machine

can now deal with any kind of cereal and turn out a clean sample with one operation only. It can be worked by two men and the out put amounts to 2,600 to 3,000 lbs. per day of 8 hours run according to the condition of the grain as it leaves the threshing floor.

Applications for Patents on the Oriental Plow, the New Seed Drill and the Improved Share have been put up to the Patent Office as sanctioned by Government with a view to protect the ideas but principally to prevent shoddy work being put into them.

Finished models of the new Seed Drill, have been sent to Bijapur and Satara Districts for testing the actual performance and comparing results with the crops, and a report on this will be given next year. Other Implements which I have taken up are :—Threshing Machine for Jowar, Groundnut Raiser, and Cotton Stalk Extractor. The first and the last judging from tests I have made will have to be redesigned entirely. This work is behind again on account of the Show work and the extra duties the Boring Section involved.

Advisory

We had 141 inquiries on technical matters of which 25 were for pumping, 70 for boring, 10 for motor plough, 4 for chaff cutter, 5 for seed drill, 2 for cane crusher and 25 of general nature. Eight estimates were supplied for pumping schemes of which two have been sanctioned for Tagai loans. Twenty-five sites have been inspected to investigate the possibilities of growing fodder as a famine measure on big rivers in Bijapur and Ahmednagar Districts and a schedule is attached to this report giving the sites which are promising. Four sites were also surveyed on the river Patalganga in Kolaba District to investigate the possibilities of installing a new invention, called the "Hydrautomat," for automatically raising water by the use of falls, but none of the sites were found to be very promising. The drawing branch has made 37 drawings and 33 sketches principally of articles to be repaired.

This year the old 11 B. H. P. Ruston Kerosine engine at Jalgaon Farm has been replaced by a new 12·5 B. H. P. Blackstone Crude Oil Engine. Also a new pumping plant consisting of a 6·5 B. H. P. Ruston and Hornsby Crude Oil Engine and a $2\frac{1}{2}$" Ruston Centrifugal Pump Class C. P. A. Z. have been installed at the Agricultural School, Dhulia, as the old plant had become entirely useless. The Deputy Director of Agriculture, N. C. D. Nasik, has been advised to purchase a combined portable chaff cutting plant to comply with the rising demand of the public in this connection and I understand that he has purchased a plant comprising a 3·5 B. H. P. Cambell cold start four cycle engine and a Richmand and Chandler Chaff Cutter, both mounted on a steel frame and driven by means of a belt. The capacity is 1,500 to 1,680 lbs. per hour.

Twenty-six students have passed through the Oil Engine Class attached to the Workshop and are now trained in the management of oil engines and pumps. During the first half of the year the shops were very busy with the Show work and later on in addition to the usual small

repairs of boring machines, were engaged in completing the modifications on the Winnower and building one new seed drill for experiments in the Bijapur District. At the moment of writing stock taking is in full swing and the writing up of the various forms.

Executive

Nangaon Plant.—The Pumping Plant at Nangaon on river Bhima, District Poona, has irrigated 299 acres 30 gunthas of land out of which 86 acres 10 gunthas are under perennial crop and the rest 213 acres 20 gunthas under seasonal crops. The total revenue realised is Rs. 4,611-4-0 and the total expenditure amounts to Rs. 11,197-10-6 including permanent staff of Rs. 1,800 for driving it. The loss is due to charging the water to the Cultivator at Canal rates which are always much lower than the rates for lift irrigation.

Hitherto the water distribution control was in the hands of the Irrigation Department but from June 11th, 1927 it has been handed over to the Irrigation Society formed at Nangaon and it is to be seen how this new arrangement fares. Previously the plant was usually run for 12 hours per day with the exception of certain days when it had to be run for a longer period to complete the turn or flood the lands for sowing purposes. Last year the plant ran for 273 days total, 50 days of which it ran for more than 12 hours. In the new arrangement it is proposed to admit more area under perennial crops and run the plant 12 hours for 8 months in the year and for 24 hours for the remaining 4 months in the year. The rates for water are going to be correspondingly increased and it is hoped that we shall not have such a great difference in the amount realised and the expenditure incurred. The plant is not completely duplicated and it is impossible to guarantee its continuous running or give an uninterrupted flow. There are two engines and two pumps, but switching from one engine to another or from one pump to another takes time. The place is moreover in the interior having very little facility for immediate repairs and delay is bound to occur. We can, therefore, make up the time lost, due to breakdowns, by working the plant for longer hours in case of the 12 hours run but it is impossible to do anything when it is required for 24 hours.

Karajgi Plant.—The Power Bruishing and Baling Plant at Karajgi in Dharwar District, worked exceedingly well last year and pressed 37,111 bales of 82 lbs. average weight or about 30,43,341 lbs. of kirbi. The cost per finished bale of 80 lbs. amounts to annas six and pies seven, including pies eight required for stacking. The output thus compares most favourably with the estimates and figures given by Mr. Keatinge in 1920, but the expenditure is slightly more on account of shorter season, extra wages of labourers and the difficulty in getting them to work for longer hours (say 10 to 12 hours a day) as presumed in the original estimate. Nevertheless the cost amounts to Rs. 14 per 1,000 lbs. of pressed kirbi including the purchase price which is less than the figure recommended for the sale of the fodder. The Bruiser is worked with one drum only as the sample is quite good enough for famine purposes and I hope to get a still better result next year. We have now at Karajgi 60,130 bales stored ready

for immediate dispatch. The bales are insured and I have also put up proposals for a fire apparatus.

Plants on hire.—There were three pumping plants on hire during the year under report one at Sholapur, another at Poona and a third engine on hire for driving a pump in Satara District. The total hire actually realised amounts to Rs. 476-4-0.

Show at Ahmedabad.—Four pumping plants noted in the margin have been sent to Ahmedabad and fixed on the 3 wells at the Show ground for the purpose of first testing the well supply and afterwards pumping for the Crop Court.

1. 16 B. H. P. Tangye Engine and 3″ Tangye centrifugal pump with pipes and connections.
2. Hayword and Tylor's Bullock power Noria.
3. Bore hole power pump with 3 B. H. P. Blackstone kerosine engine complete with connections.
4. 3″ Aquatole Lift with 5 B. H. P. Petter Junior Kerosine engine.

Boring.—The question of the reorganisation of the boring work is still undecided. Consequently with the assistance of my two Boring Overseers I have managed to keep 37 machines (hand 27 and 10 Power) working in the Presidency to cope with the demand from the various Districts. The total number of bores both made from surface and also from the bottom of existing wells amounts to 158 of which 78 are successful, according to our standard of success which is taken at 250 gallons per hour continuously for 8 hours, and according to Major Pogson standard 114 are successful. The total footage amounts to 7,675 feet. Majority of the unsuccessful bores are shallow and had to be given up at the request of the owner. Out of the total number of bores made 18 are absolutely dry.

The training of men to work the boring machine had to be continued for the whole year round partly to get new men trained for the Department and partly for private institutions and Native States including two for Ichalkaranji State and two for Messrs. Richardson & Cruddas, Bombay.

This year the number of accidents and breakdowns was comparatively less on account of the men being more conversant with the working of the machines in the district, and still better results are likely to be obtained as they get more and more experienced and get better supervision. In the present state of things more timely supervision is impossible with such a big number of machines scattered over the Presidency with only 2 Boring Overseers.

In addition to keeping the requisite number of machines working in the Presidency and attending to repairs we have converted 7 Musto hand machines into power units, thus making all the machines in the Divisions power machines.

The success and progress of boring work does not rest entirely with the skill of Operator, it also depends a lot on the cultivator's will to carry out the work to the required depth and the supply of necessary labour and material.

In many cases the work even at a shallow depth is stopped according to the will of the cultivator. This naturally increases shifting of machines to sites and decreases the output and the percentage of success.

During the year under report the following has been made in the way of improvements and modifications.

Improvements made in working the Calyx machine for better results are :—

1. To cut two vertical slots in shot bits instead of one.
2. To use $\frac{1}{2}$ to $\frac{3}{4}$ lbs. of shots per foot instead of 3 lbs. per foot.
3. To reduce the water to one gallon per minute from 4 gallons per minute.

Modifications :—

1. Fitting of 2 grease cups to the drill spindle brasses instead of ordinary oil holes.
2. Extension to the push rod lever of the pump in order to facilitate use of any type of belt fasteners.
3. Use of brass grout cocks instead of C. I. ones.

Hand Machines :—(1). The machine has been modified to make 100 feet deep bores instead of 65 as hitherto.

(2). Tests of different kinds of steel are being conducted with a view to minimise fettling of tools and thereby to get an increased outturn. In one case a special steel bar worked for over a week without fettling where the ordinary time is 4 hours.

Testing of bores :—Power pump has been used for testing 3″ bore holes delivering 500 gallons of water per hour directly from surface bore holes. Hitherto only hand pumps of 250 gallons capacity were being used.

A schedule giving the details of bores made is herewith attached.

General

Great strides have been made in the Mechanical Engineering world, especially as applied to Agriculture since the advent of my Department. For instance there is the internal combustion kerosine engine which in the early days was a common substitute for steam but with its lamp or stove, hot bulb and complicated mechanism was a nuisance. Now we have splendid specimans of engineering practice represented in the Crude Oil Engines which are well made by firms of high repute and are built in small sizes suitable for the small owners and which can be run easily and cheaply.

I think they should be set up as demonstration plants in certain parts of the Presidency to show the cultivator the cheap and efficient method of power available.

As regards tractors, the models of 1918-19 are completely outclassed and now we have machines on the market in which are embodied all the latest ideas and are products resulting in years of experience. Here again I think demonstration plants should be installed to plough land and demonstrate the modern methods of tractoring to the cultivators.

There are other instances, but the two given above are perhaps two of the more important.

Tests of new implements should be a factor in my line of work in addition to the remodelling of indigenous implements as there are cases when the new design of modern implement would be better than the local one even with the best of improvement.

However, we are with our staff and equipment making every endeavour to help the cultivator in solving his labour saving device problems and increasing the efficiency of his implement.

I have to record the great help and assistance rendered by my staff during the year under review.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

Statement showing particulars of famine pumping sites in the Bombay Presidency approved

Serial No.	District	Taluka	Village	River	Area available in acres
1	Ahmednagar ..	Sangamner ..	Khandgaon ..	Prawara ..	100
2	Do. ..	Do. ..	Vaghapur ..	Do. ..	200
3	Do. ..	Do. ..	Warkhed ..	Godavari ..	200
4	Satara ..	Karad ..	Tambva ..	Krishna ..	100
5	Do. ..	Walva ..	Kasegaon ..	Do. ..	100
6	Bijapur ..	Bagalkot ..	Banidinni ..	Ghata prabha ..	100
7	Do. ..	Indi ..	Bargudi ..	Bhima ..	100

Serial No.	District	Approximate total lift in feet	Size of Pump and Power of engine required for area	Survey No.	Remarks
1	Ahmednagar ..	30′	6″ Pump and 17 B. H. P. engine.	103	Promising.
2	Do. ..	50′	8″ Pump and 62 B. H. P. engine.	13	Do.
3	Do. ..	50′	Do. ..	142	Do. (II class).
4	Satara ..	50′	6″ Pump and 32 B. H. P. engine.	35, 40 and 42	Promising.
5	Do. ..	50′	Do. ..	560	Fairly Promising.
6	Bijapur ..	50′	6″ Pump and 30 B. H. P. engine.	Near Gavthan.	Promising.
7	Do. ..	80′	6″ Pump and 40 B. H. P. engine.	487	Do.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

Poona, 14th July 1927.

Statement of Bores for 1926-27

Statement of Bores

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Poona District			
1	Mr. M. S. Hakim	Not known ..	Poona ..	Haveli ..
2	Do.	Do. ..	Do. ..	Do. ..
3	The Economic Botanist ..	Do. ..	Do. ..	Do. ..
4	Mr. S. Y. Abhyankar ..	Bhamburda Colony	Do. ..	Do. ..
5	Mr. P. L. Modak	Do. ..	Do. ..	Do. ..
6	Agricultural Engineer, Poona ..	Workshop ..	Do. ..	Do. ..
7	Do. do. ..	Do. ..	Do. ..	Do. ..
8	Do. do. ..	Do. ..	Do. ..	Do. ..
9	Do. do. ..	Do. ..	Do. ..	Do. ..
10	Taluka Local Board ..	Gaothan ..	Indapur ..	Indapur ..
11	Agricultural Department Demonstration Bore.	Not known ..	Poona ..	Haveli ..
	Nasik District			
12	Public Well	Not known ..	Jopool ..	Dindori ..
13	Mr. Govindji Zipra Mali ..	120	Pimpalgaon ..	Kalvan ..
14	Mr. Fakira Bhika Patil ..	148	Do. ..	Do. ..
15	Mr. Hanmantram Daulatram Somawanshi.	Not known ..	Madki Jand ..	Dindori ..
16	Mr. Hiraman Narayan Shindore	Gaothan ..	Nasik ..	Nasik ..
17	Mr. Dagadu Balaji Kasar ..	Not known ..	Do. ..	Do. ..
18	Mr. Ebrahim Fakir Kokani ..	Do. ..	Do. ..	Do. ..
	West Khandesh			
19	District Local Board ..	D. L. B. Office ..	Dhulia ..	Dhulia ..
20	Mr. Motibhai Vithaldas Shaha ..	Gaothan ..	Nandurbar ..	Nandurbar ..
21	Mr. Supadoobhai Kishordas Shaha.	Do. ..	Do. ..	Do. ..
	Surat District			
22	Mr. Ghelabhai Pragji ..	Ginning Factory ..	Madhi ..	Bardoli ..
23	Do. ..	Do. ..	Do. ..	Do. ..
24	Mr. Morar Purshottam ..	32	Surali ..	Do. ..
25	Do. ..	32	Do. ..	Do. ..
26	Mr. Dayabhai Bhavanbhai ..	222	Wakaner ..	Do. ..
27	Do. ..	222	Do. ..	Do. ..
28	Mr. Naservanji Jamshedji ..	65	Do. ..	Do. ..
	Panch Mahals			
29	K. B. Mahamad Miya ..	Not known ..	Moti Kothadi ..	Godhra ..
30	Mr. Koyalal Fakirlal Kalal ..	Do. ..	Jesawada ..	Dohad ..
31	Mr. Shamaldas Bawa ..	Gaothan ..	Dohad ..	Do. ..

for 1926-27

Diameter of the hole	Depth of boring		Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
Inches	Ft.	in.			
3	61	0	*Nil* ..	250	
3	11	0	Do. ..	*Nil* ...	Stopped at owner's request.
3	50	0	Do. ..	100	
3	50	0	Do. ..	250	
3	58	6	Do. ..	*Nil*	
6	215	0	Do. ..	250 ...	For testing and demonstration purposes.
3	60	0	Do. ..	250	Do. do.
3	90	0	Do. ..	250	Do. do.
3	65	0	Do. ..	250	Do. do.
6	96	0	Do. ..	20	
6	32	0	Do. ..	4	
3	8	6	*Nil* ..	*Nil* ..	Left at owner's request.
3½	12	9	Do. ..	Do. ..	Do.
3½	5	7	Do. ..	Do. ..	Do.
2½	1	9	Do. ..	Do. ...	Do.
6	70	0	Do. ..	10	
6	37	6	Do. ..	*Nil* ..	Left at owner's request.
6	51	6	250	260	
6	50	6	*Nil* ..	10	Total depth of bore is 158 feet.
6	216	9	Do. ..	250	
6	119	6	Do. ..	250	
6	108	0	Not known ..	1,000	
6	50	0	Do. ..	250	
6	50	0	*Nil* ..	1,000	
6	30	0	Do. ..	100	
6	173	0	Do. ..	250	
6	85	0	Do. ..	50	
6	168	0	Not known ..	60	
6	167' + (17')		Not known ..	100	17 feet were bored last year.
6	17	0	Do. ..	.....	Stopped at owner's request.
6	10	0	*Nil* ..	.....	Do.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Ahmednagar District			
32	Taluka Local Board	Gaothan	Khadki	Ahmednagar
33	Do.	Do.	Jadhav Wadi	Do.
34	Do.	Do.	Akolner	Do.
35	Do.	Do.	Arangaon	Do.
36	Do.	Do.	Wadgaon Pan	Sangamner
37	Do.	Do.	Do.	Do.
38	Do.	Do.	Nimgaon Jali	Do.
39	Do.	Do.	Gogalgaon	Do.
40	Mr. Namdeo Kasar	Do.	Sangamner	Do.
41	Do.	Do.	Do.	Do.
42	Mr. Y. V. Kokil	Do.	Do.	Do.
43	Mr. T. K. Joshi	Do.	Do.	Do.
44	Do.	Do.	Do.	Do.
45	Local Board Well	Do.	Rahuri	Rahuri
46	Do.	Do.	Do.	Do.
47	Do.	Do.	Chinchore	Newase
48	Do.	Do.	Do.	Do.
49	Do.	Do.	Sonai	Do.
50	Do.	Do.	Do.	Do.
51	Do.	Do.	Babhulgaon	Rahuri
52	Do.	Do.	Astagaon	Parner
53	Do.	Do.	Do.	Do.
	Kaira District			
54	Demonstration Bore	2010	Dakore	Thasra
	Sholapur District			
55	Karmala Ginning Factory	Gaothan	Karmala	Karmala
56	Do.	Do.	Do.	Do.
57	Do.	Do.	Do.	Do.
	Satara District			
58	Local Board Well	Gaothan	Wadooj	Wadooj
59	Do.	Do.	Kaledhon	Do.
60	Do.	Do.	Vikhali	Do.
61	Do.	Do.	Padali	Do.
62	Do.	Do.	Dalmodi	Do.
63	Do.	Do.	Do.	Do.
64	Do.	Do.	Wangi	Tasgaon
65	Do.	Do.	Soni	Do.
66	Do.	Do.	Do.	Do.
67	Do.	Do.	Samdoli	Do.

Diameter of the hole	Depth of boring		Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
Inches	Ft.	In.			
6	58	8	*Nil* ..	120	
6	51	0	Do. ..	100	
6	76	3	Do. ..	500	
6	175	0	Do. ..	30	
3½	27	0	Do. ..	2	
3½	33	0	Do. ..	[illegible]	
3½	10	0	Do. ..	100	
3½	18	6	Do. ..	20	
3½	10	0	20	1,000	
3½	10	0	*Nil* ..	1,000	
3½	10	0	Do. ..	1,000	
3½	13	0	1,000	2,000	
3½	10	0	1,000	1,500	
3½	39	0	*Nil* ..	20	
3½	28	0	Do. ..	15	
3½	27	4	Do. ..	25	
3½	17	0	Do. ..	25	Quite dry.
3½	15	3	Do. ..	....	Left at owner's request.
3½	5	0	Do. ..	50	
3½	13	6	Not known ..	250	
3½	37	6	*Nil* ..	*Nil*	
3½	43	6	Do. ..	Do.	
6	87	0	*Nil* ..	150	95 feet boring was made last year. Total depth 182 feet.
3½	66	0	*Nil* ..	150	
3½	45	0	Do. ..	*Nil*	Left at owner's request;
3½	15	0	....	....	On hand;
3½	61	0	*Nil* ..	250	
3½	45	0	Do. ..	250	
3½	38	6	Do. ..	250	
3½	57	6	Do. ..	25	
3½	27	6	Do. ..	250	
3½	26	0	Do. ..	....	On hand.
3½	40	0	Do. ..	....	Left at owner's request.
3½	30	0	Do. ..	....	Mishap of tool; left at owner's request
3½	36	9	Do. ..	50	
3½	48	0	Do. ..	....	On hand.

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Bijapur District			
68	Taluka Local Board ..	Gaothan ..	Muddebihal ..	Muddebihal ..
69	Do. ..	Do. ..	Do. ..	Do. ..
70	Do. ..	Do. ..	Nalwatwad ..	Do. ..
71	Do. ..	Do. ..	Do. ..	Do. ..
72	Do. ..	Do. ..	Mudual ..	Do. ..
73	Do. ..	Do. ..	Benkatti ..	Bagalkot ..
74	Do. ..	Do. ..	Do. ..	Do. ..
75	Do. ..	Do. ..	Sirur ..	Do. ..
76	Do. ..	Do. ..	Hulasgeri ..	Badami ..
77	Do. ..	Do. ..	Nirbudihal ..	Do. ..
78	Do. ..	Do. ..	Karkalmatti ..	Do. ..
79	Do. ..	Do. ..	Do. ..	Do. ..
80	Do. ..	Do. ..	Do. ..	Do. ..
81	Do. ..	Do. ..	Hangal Buddihal ..	Do. ..
82	Do. ..	Do. ..	Do. ..	Do. ..
83	Do. ..	Do. ..	Hulgeri ..	Do. ..
84	Do. ..	Do. ..	Do. ..	Do. ..
85	Do. ..	Do. ..	Do. ..	Do. ..
86	Do. ..	Do. ..	Bilkerur ..	Bagalkot ..
87	Do. ..	Do. ..	Do. ..	Do. ..
88	Do. ..	Do. ..	Shirur ..	Do. ..
89	Do. ..	Do. ..	Do. ..	Do. ..
90	Do. ..	Do. ..	Konnur ..	Do. ..
91	Do. ..	Do. ..	Do. ..	Do. ..
92	Do. ..	Do. ..	Do. ..	Do. ..
93	Do. ..	Do. ..	Do. ..	Do. ..
94	Do. ..	Do. ..	Nawarajpur ..	Bijapur ..
95	Do. ..	Do. ..	Honutagi ..	Do. ..
96	Mr. Bhaurao Nadgavda ..	Not known ..	Nimbal ..	Indi ..
97	The Mamlatdar of Sindgi ..	Do. ..	Korwar ..	Sindgi ..
98	Mr. Krishtappa Kulkarni ..	333	Sindgi ..	Do. ..
99	Mr. Siddappa Subbappa Birada	Gaothan ..	Angadgiri ..	Bagewadi ..
100	Mr. Dandappa Siddappa Patil ..	Do. ..	Do. ..	Do. ..
101	Mr. Hanmantrao Bhimappa ..	Not known ..	Telgi ..	Do. ..
102	Mr. Daddyappa Shivappa ..	Do. ..	Do. ..	Do. ..
103	Mr. Bassappa Aminappa ..	Do. ..	Do. ..	Do. ..
104	Mr. Hanmanappa ..	12	Bisnal ..	Bilgi Peta ..
	Ichalkaranji State			
105	The Chief of Ichalkaranji ..	Almari Mala ..	Ichalkaranji ..	Ichalkaranji ..
106	Do. do. ..	Kodi Mala ..	Do. ..	Do. ..
107	Do. do. ..	Hawa Mahal ..	Do. ..	Do. ..

Diameter of the hole	Depth of boring	Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
Inches	Ft. in.			
6	13'+(35')	*Nil* ..	*Nil* ..	35 feet bored in last year.
6	60 0	Do. ..	120	
6	21 0	Do. ..	100	
6	30 0	Do. ..	10	
6	20 0	Do. ..	500	
6	75 0	Do. ..	*Nil* ..	Quite dry.
6	100 0	Do. ..	6	
6	26 0	....	....	On hand.
6	13 0	*Nil* ..	....	Left at owner's request.
3½	43 0	Do. ..	250	
3½	65 0	Do. ..	*Nil* ..	Quite dry.
3½	117 0	Do. ..	Do. ..	Do.
3½	105 0	Do. ..	250	
3½	51 0	Do. ..	*Nil* ..	Quite dry.
3½	105 0	Do. ..	250	
3½	90 0	Do. ..	*Nil* ..	Quite dry.
3½	139 0	Do. ..	Do. ..	Do.
3½	86 6	Do. ..	Do. ..	Do.
3½	32 2	Do. ..	Do. ..	Do.
3½	51 0	Do. ..	250	
3½	36 3	Do. ..	*Nil* ..	Quite dry.
3½	47 0	Do. ..	Do. ..	Do.
3½	23 9	Do. ..	250	
3½	13 6	Do. ..	250	
3½	17 0	Do. ..	250	
3½	7 0	Do. ..	....	Work stopped at owner's request.
3½	13 6	....	....	On hand.
3½	49 0	Surface ..	50	
3½	18 0	Do. ..	250	
3½	3 3	....	....	Stopped at owner's request.
3½	15 7	*Nil* ..	....	Do.
3½	15 0	Do. ..	1,000	
3½	15 0	Do. ..	1,000	
3½	41 0	Do. ..	40	
3½	16 0	Do. ..	*Nil* ..	Left at owner's request.
3½	19 0	Do. ..	Do. ..	Do.
3½	15 0	Do. ..	250	
3	66 0	*Nil* ..	250	
6	204 0	Do. ..	250	
3½	95 0	Do. ..	10	

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Dharwar District			
108	Sardar L. M. Heblikar ..	Not known ..	Hebli ..	Dharwar ..
109	Do. ..	Do. ..	Do. ..	Do. ..
110	Mr. Dixit Pleader ..	Do. ..	Navloor ..	Do. ..
111	Mr. N. O. Desai ..	48/2	Narendra ..	Do. ..
112	Mr. B. R. Nadgauda ..	179	Garag ..	Do. ..
113	Do. ..	12	Do. ..	Do. ..
114	Do. ..	13	Do. ..	Do. ..
115	Mr. A. K. Desai ..	60	Hangarki ..	Do. ..
116	Do. ..	60	Do. ..	Do. ..
117	Mr. Lingangauda ..	1	Deogaondankatti .	Ranibennur .
118	Mr. Fakirappa Bharamappa ..	1	Do. ..	Do. ..
119	Mr. Harihargauda Lingangauda .	1	Itgi	Do. ..
120	Mr. Hanmangauda Basangauda .	1	Do.	Do. ..
121	Mr. Fakirappa Bothappa ..	12	Do.	Do. ..
122	Mr. Subhaji M. Nadgir ..	46	Do.	Do. ..
123	Do. ..	Gaothan ..	Do.	Do. ..
124	Mr. Kotrappa M. Muddi ..	Do. ..	Do.	Do. ..
125	Mr. R. D. Mudyannavararao ..	12	Karur ..	Do. ..
126	Mr. R. D. Patil ..	Not known ..	Do. ..	Do. ..
127	Public Well ..	Gaothan ..	Chikyedchi ..	Hirekerur ..
128	Mr. Kuraliappa Bankar ..	Not known ..	Honnatti ..	Ranibennur ..
129	Mr. Karelappa Tai Bhimrao ..	Do. ..	Do. ..	Do. ..
130	Mr. Morarjiappa Brahmshetappa	Do. ..	Motebennur ..	Do. ..
131	Do. do. ..	Do. ..	Do. ..	Do. ..
132	Mr. Hatalmani ..	Do. ..	Do. ..	Do. ..
133	Mr. G. H. Walikar ..	Do. ..	Honnati ..	Do. ..
134	Taluka Local Board Well ..	Gaothan ..	Do. ..	Do. ..
135	Public Bore ..	Do. ..	Hullati ..	Hirekerur ..
136	Do. ..	Do. ..	Chikmatur ..	Do. ..
137	Mr. Bassappa R. Bharate ..	Not known ..	Dharwar ..	Dharwar ..
138	The Saraswat Society ..	Gaothan ..	Do. ..	Do. ..
139	Mr. M. Shidramappa ..	Not known ..	Hosalli ..	Hirekerur ..
140	Mr. R. S. Patil ..	Do. ..	Tavargi ..	Do. ..
141	Public Bore ..	Gaothan ..	Kallignoor ..	Ron ..
142	Sardar Mahiboobalikhan ..	Do. ..	Guttal ..	Haveri ..
143	Do. do. ..	Do. ..	Do. ..	Do. ..
144	Do. do. ..	Do. ..	Do. ..	Do. ..
145	Mr. Parappa Chikki ..	Do. ..	Do. ..	Do. ..
146	Mr. Aminbhai Madarsab ..	Not known ..	Shirbadgi ..	Do. ..
147	Mr. Manusab Madarsab ..	Do. ..	Do. ..	Do. ..

Diameter of the hole	Depth of boring		Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
Inches	Ft.	in.			
3½	50	5	*Nil* ..	250	
3½	50	0	Do. ..	250	
3½	65	0	Do. ..	250	
3½	50	0	Do. ..	250	
3½	65	0	Do. ..	1,500	
3½	80	0	Do. ..	250	
3⅜	72	0	Do. ..	250	
3½	20	0	Not known ..	300	
3½	14	0	Do. ..	250	
3½	33	0	500	2,500	
3½	25	0	*Nil* ..	1,500	
3½	35	0	1,000	2,000	
3½	50	0	1,000	2,000	
3⅝	50	0	*Nil*	2,000	
3½	24	0	Do. ..	2,000	
3½	29	0	Do. ..	1,000	
3½	31	0	Do. ..	1,000	
3½	27	0	Do. ..	1,000	
3½	62	6	Do. ..	250	
3½	50	0	Do. ..	250	
3½	35	0	500	1,000	
3½	27	0	300	1,300	
3½	35	0	500	750	
3½	21	0	500	1,000	
3½	15	0	200	650	
3½	35	0	*Nil* ..	1,000	
3½	40	0	Do. ..	250	
3½	25	0	Do. ..	250	
3½	36	0	Do. ..	250	
3½	80	0	Do. ..	250	
3½	40	0	250	500	
3½	25	0	*Nil* ..	250	
3½	42	0	Do. ..	*Nil* ..	Quite dry.
3½	25	0	Do. ..	250	
3½	38	0	250	1,000	
3½	38	0	*Nil* ..	100	
3½	32	0	Do. ..	25	
3½	17	0	Do. ..	500	
3½	56	0	Not known ..	1,500	
3½	62	0	*Nil* ..	500	

Serial No.	Name of the Owner	Survey No.	Village	Taluka
	Dharwar District—contd.			
148	Mr. Ningappa Bassappa ..	Not known ..	Shirbadgi ..	Haveri ..
149	Mr. Shivangauda Patil ..	Do. ..	Mudenur ..	Ranibennur ..
150	Mr. Nila Malla Madar ..	Do. ..	Bhilhalli ..	Do. ..
151	Mr. Irappa Chenbasappa ..	Do. ..	Do. ..	Do. ..
152	Mr. Hanmappa Somappa ..	18	Mankoor ..	Do. ..
153	Mr. Rango Vyanktesh ..	Gaothan ..	Ranibennur ..	Do. ..
154	Public Bore	Do. ..	Bad ..	Bankapur ..
155	Mr. Virabhadra Patil ..	Not known ..	Do. ..	Do. ..
156	Mr. Mahamad Hussein Ahamad .	Do. ..	Do. ..	Do. ..
157	Taluka Local Board Well ..	Gaothan ..	Ranibennur ..	Ranibennur ..
158	Do. do. ..	Do. ..	Magod ..	Do.

Diameter of the hole	Depth of boring		Water before boring in gallons per hour	Water after boring in gallons per hour	Remarks
Inches	Ft.	in.			
3¼	66	0	500	1,000	
3	84	0	*Nil* ..	*Nil* ..	Quite dry.
3	29	10	Do. ..	Do. ..	Do.
3	16	0	Do. ..	250	
3	23	9	Do. ..	250	
3½	10	0	....	....	On hand.
3	65	3	*Nil* ..	50	
3	64	0	Do. ..	25	
3	52	6	....	....	On hand.
3	30	0	*Nil* ..	250	
3	30	0	....	....	On hand.

W. M. SCHUTTE,
Agricultural Engineer,
Bombay Presidency, Poona

APPENDIX Q

Annual Report of the Horticulturist to Government, Bombay-Poona, for the year 1926-27

Staff

Dr. G. S. Cheema, held the charge of the office of the Horticulturist to the Government, during the whole of the year except from 23rd November 1926 to 23rd December 1926, when Mr. H. P. Paranjpye, held charge of that office. Mr. H. P. Paranjpye, the District Horticultural Officer, was on two months' leave on average pay from 10th March to 9th May 1927. Mr. P. G. Dani, acted for him. Mr. P. G. Joshi, Superintendent, Ganeshkhind Botanical Gardens, was on leave for the most part of the year. His place was taken by Mr. S. S. Bhat during his leave of absence. Mr. G. B. Deshmukh, was deputed to Andamans to hold the post of the Agricultural Officer, Andamans and Nicobar Islands, there. He returned from that place during November to resume his original duties. Mr. S. R. Gandhi, was on leave for the whole of the year, and Mr. V. H. Kulkarni, acted for him.

The financial condition of the section was as follows :—

	Sanctioned grant	Expenditure	Receipts
	Rs.	Rs. a. p.	Rs. a. p.
(1) Office of the Horticulturist and the District Horticultural Officer, Poona	3,850	3,849 13 0	*Nil*
(2) Ganeshkhind Botanical Gardens	8,745	8,738 0 0	1,646 3 3
(3) Modibag, Agricultural College, Poona ..	7,500	7,499 12 9	3,289 2 6

Although a great deal of our time was occupied in preparing for the visit of His Excellency the Viceroy to our Horticultural Show area (Modibag) and the Presidency Agricultural Show held at Poona, our publication work has been very satisfactory. During the year under report the following bulletins and articles were published :—

(1) Bulletin No. 131 of 1926. The Fig Industry in Asia Minor.

(2) Bulletin No. 133 of 1926. Work of the Ganeshkhind Botanical Gardens, and Modibag, for 1921-1925.

(3) Bulletin No. 137 of 1927. Notes on the lemon Industry in Italy.

(4) Refrigeration as a means of preserving mangoes, and other tropical fruits. The Agricultural Journal of India, Volume XXI, September 1926.

It may also be mentioned here that Mr. S. R. Gandhi, has successfully competed for his M.Ag. degree of the University of Bombay.

I take this opportunity to thank all the members of my section as well as others for their sincere co-operation in making the Horticultural Court an object of real interest during the last Presidency Agricultural Show. Over one lakh of visitors were received by us and about forty

thousand plants were distributed free of cost to the public. It was a special feature of this section to present a plant which a visitor most desired to have. All visitors showed a keen interest in the progress made by the Horticultural section.

Teaching Work

The number of students taking Horticulture as an optional subject is increasing every year. The practical course comprising of fruit culture, ornamental gardening, canning and bottling is so heavy, that our present inadequate staff and equipment do not allow us to do the work with a thoroughness and efficiency that we desire. The Horticulturist to Government is invariably assisted by the District Horticultural Officer, the Demonstrator, the Superintendents of Modibag and Ganeshkhind Botanical Gardens, and sometime by the Graduate Assistants in conducting the lectures and the practicals. Their help is necessary in order to complete the course prescribed by the University but this greatly interferes with their own work. It is, therefore, essential to reiterate that a whole-time Assistant Professor of Horticulture may soon be appointed as suggested in the Government Order No. 12179 of 13th November 1919, Revenue Department.

Laboratory Work

Much time was devoted to the bottling of different kinds of juices; (2) to the preparation of jellies from different kinds of fruits; and (3) candying of bor fruits. It is with the assistance of Messrs. P. G. Dani, and V. H. Kulkarni, that the brief survey of the fruit preservation in the Presidency also has been made. It is noteworthy that half a million rupees worth fruits are preserved in the Presidency annually.

Mango packing experiments have been undertaken during the mango season of 1927. It is ascertained that a good deal of profit can be realised by using boxes instead of baskets.

Ganeshkhind Botanical Gardens

Citrus stock.—The Santra grafts on the Kavat (Feronia Elephantum) stocks have grown to a considerable size and are progressing well. No conclusions are at present available.

The Die-back of Citrus Trees.—(*a*) Observation on the growth of Santra plants grown in different soils were continued as in the previous year. The plants cultured in the different soils have shown a vast difference in their growth and vigour. The sticky shadu soil and the open sandy soil have both manifested the preliminary symptoms of die-back.

(*b*) Plants, grown in river soil under complete waterlogged conditions alternately followed by extreme drought, are now showing the symptoms of the progressing die-back.

(*c*) Plants grown in river soil in boxes, all the sides of which are lined with slate-stones, so as to provide an artificial hard pan below the soil, are growing well and have not yet shown any clear symptoms of the disease.

(*d*) An attempt was made to revive the Mosambi plants which were very much stunted in growth and were dying back on account of being grown in shadu soil. Two of these plants were treated with 10 lbs. of lucerne field soil each. Leafmould has shown a better and more lasting effect in improving the affected plants than the lucerne field soil.

(*e*) Trials about the effect of good and bad root pruning on the citrus plants as also a set of experiments to find out the particular physical or chemical factor that is the cause of the bad effect of the shadu soil, are on hand. The results of these experiments will be available in due course of time.

(*f*) Trenching for drainage and aeration, and manuring with ammonium sulphate, lucerne field soil and leafmould have been done in the field on 110 Santra trees in all. Trenching and leafmould seem to induce the quickest and best response.

(*g*) In a short survey of the disease in the Poona and the Ahmednagar districts, it was observed that wherever the soil was very sticky and water conditions were such as to bring about either complete stagnation or extreme drought at the roots of the trees, the disease ravages were serious. A well-drained light soil like that on the banks of rivers, as at Rahuri in the Ahmednagar District, can rear citrus trees in very good condition for over thirty years.

(*h*) Regarding the varietal susceptibility of the trees to this disease it may be said that the Santras and the Mosambis are the most susceptible of all the citrus varieties, on the same stock.

Banana Seedlings

Some of the suckers of the seedlings of the Sonkel-chanda variety have shown a very interesting variation from the mother plant in having a pale saffron colour of the pulp at the centre of their fruits. The mother plant had a uniform paper-white colour of the pulp. If the saffron colour of the fruit of these suckers proves to be a fixed and stable character, then we shall definitely have quite a new variety of bananas. Further observations are continued.

Two suckers from the seedlings of the Nendrabali variety have flowered in the Ganeshkhind Botanical Gardens, Kirkee. But nothing definite can be said regarding their quality.

Guavas

An attempt was made to cross the Lucknow variety of guavas (Psidium Guyava) with the straw-berry guava (Psidium Molle). Only two fruits developed. The fruits were lengthwise hollow inside. Seeds developed in the middle of the cavity, leaving a hollow space at both ends. These seeds were not embedded in the pulp of the fruit as usual, but were attached to the sides of the cavity as in the case of the Papaya fruits. The seeds did not germinate on sowing.

Guava seedlings, raised from the seeds of one and the same fruit, have borne for the last three years. There is no variation in the colour of the pulp of fruits of different seedlings; but the seedlings vary very widely so far as the shape and size of the fruits are concerned.

Papaya.—A lot of " transplanted " *versus* "In situ" papaya seedlings has confirmed our previous conclusion in favour of raising papaya plantations by the transplanted method.

Transplanting of large mango trees :—Six out of the seven mango trees, transplanted under our supervision by the authorities of the Kankeshwar Samsthan of the Kolaba District, have survived. These trees vary from 10 to 16 feet in height with a girth from 9 to 20 inches near the collar.

Ornamental.—A small octagonal shed has been constructed newly in plot No. 2 for rearing a number of orchids of different varieties. This is fairly well equipped and can afford an excellent opportunity of studying this interesting class of plants for the students specializing in Horticulture in the College.

Nursery Improvement.—About 12 years ago efforts were made in the Ganeshkhind Botanical Gardens to propagate *Kagadi Limbu* plants by budding and since then these plants are raised by this process to a limited extent. Local nurserymen have been induced to prepare plants in this manner. This year the art of budding Kagadi Limbu plants has made remarkable progress and over 4,000 plants are now offered for sale by nurserymen. This is a very distinct improvement in the raising of nursery plants.

Eucalyptus

Seeds and seedlings of about 30 varieties of Eucalyptus were received through the Director of Agriculture, Bombay Presidency, Poona, for trial at the Ganeshkhind Botanical Gardens, Kirkee. The seeds of a number of these varieties failed to germinate and some of the seedlings died after germination. However, there are at present 68 plants of eleven varieties growing very well in plot No. 15.

Modibag

Citrus stocks.—The Santra and Mosambi plants budded on Id and sour lemon stock bore fruit this year for the first time. The effect of Id stock on the Mosambi scion cannot be definitely stated. It is observed that the fruits thus borne on the grafts on the Id have a thicker skin and warty surface. The fruits in general were certainly bigger than those borne on the Jamburi stocks. Those grafted on the sour lemon stocks have just come out to fruiting. We cannot say anything definite about them for the present. Their growth is watched with interest.

Exotic figs.—Large number of fig varieties have been imported from France, Italy and Greece for trials at Poona. These are growing well under our careful supervision. Arrangements are being made to plant them in the orchards in Ganeshkhind Botanical Gardens.

Improvement of Grape by Breeding and Selection.—A large number of new types of Pandhari Sahebi grape have been developed by breeding and selection. Some of these new types are fertile and dry into good raisins. This work has been much extended now and a large number of seedlings of several other types have been planted with a view to develop better quality of grape.

Sulphur dusting.—This work has been carried in co-operation with the Plant Pathologist to Government. It has been observed that the application of sulphur is more economical to fight against mildew than bordeaux mixture. It is seen that the cost is a great deal less than spraying with bordeaux mixture. The method of its application is published in the Department leaflet No. 6 of 1927.

Grape variety trials.—In addition to the types that we have distributed to the people in the Presidency,—fruit growers have also been importing foreign varieties. For example, Mr. A. B. Godrej, in the vicinity of Nasik, tried to plant some Australian grapes. So far he has succeeded well in his efforts. Some of his types have flourished and borne fruit, which may be described thus :—

(1) *Black Hamburg.*—This black berry is sweet in taste, and aromatic, medium in size, bears well, the growth is not rampant. On an average, its yield is good as that of Bhokari, the berry has a thick skin and a good storage quality.

(2) *Muscat Hamburg.*—It is almost equally good as the Black Hamburg.

(3) *Cross Colman.*—This is a stout Australian variety with a big berry and profuse vegetative growth. It is not of a superior quality as it has a thick skin and a watery taste without any sort of aroma in it.

(4) *Gordo Blanco.*—It has a white large berry with a peculiar oily taste and aroma. It does not soften but takes uniform wrinkles when stored for a long time. It seems to be well adapted for drying purposes.

(5) *Sweet water.*—It is a small white berry on an unusually long pendulous bunch. Its taste is sweet but has a very thick skin and not so attractive.

Root-exposure.—It has been observed that in the case of mango roots cut-end-wounds take a long time to heal and produce but a few rootlets as compared with those of the citrus trees.

Smudging.—A report has been received from Mr. Godrej's fruit farm that smudging has been found very effective against frosty weather in the vineyards in the months of December and January.

Advisory Work

In addition to the daily advisory work regarding the cultivation of fruit trees, our activities mainly embrace the following :—

(1) Budding of wild " bor " plants in the Gujarat.

(2) Extension of grape and fig plantations in the taluka of Baramati.

(3) Demonstrations in canning of mango fruits in the Konkan and in the South Central Division. More than 200 persons have taken practical lessons during the course of our demonstrations.

(4) Extraction of borers from the trunks of mango trees.

During the year under report we have successfully handled thousands of wild bor trees and grafted them with choice types in the district of Surat. More than 25 acres have been planted with grape at Baramati.

Large number of fig plantations have also been raised in the irrigated parts of the Poona District and its increasing extension shows an evidence of the keen interest in its cultivation.

It may be mentioned here that we have distributed more than 40,000 plants free of cost to the fruit growers in the Presidency just to encourage fruit cultivation. The number of enquiries has also enormously increased partly on account of the Poona Agricultural Show and chiefly perhaps due to the real service that we have often rendered to the public. In fact the progress of our advisory work is so helpful that it suggests a great horticultural awakening and we are now feeling the necessity of suggesting an increase on our staff.

G. S. CHEEMA,
Horticulturist to Government.

APPENDIX R

Summary of Work done under the Inspector of Agricultural Schools, Bombay Presidency, Poona, for the Year 1926-27

Staff.—The permanent incumbent Mr. K. M. Pawar, being deputed to take charge of the post of Deputy Director of Agriculture, N. C. D., Nasik, from the latter part of May 1926, I held charge of the post during the remaining period of the year. The District Agricultural Overseers were made available, as in the last year, to conduct annual examinations of the Agricultural bias classes including the Vernacular Final Examination (Agricultural).

Nature of work.—The nature of the work has been, as in previous years, mainly advisory both in connection with the Vernacular Agricultural Schools and the Agricultural Bias *Classes* attached to primary schools. Both these types of Institutions were supervised and inspected. But owing to the Poona Agricultural Show, in which the work of these two types of institutions was represented, I had no touring for three months from September to November and again owing to some trouble at the Loni Agricultural School, I had to discontinue touring for another three months from January to March. Being thus engaged in other work during the important touring period, the institutions could not be visited as frequently as was necessary. Some attempt was made during the year with the help of the Deputy Director of Agriculture, S. D., Dharwar, to organise an association of past students of Devi-Hosur Agricultural School.

Vernacular Agricultural Schools.—The number of the schools remained the same as in the last year, *viz.*, six. The number of applications for admission greatly increased during the year. Curriculum remained practically the same. But more attention was paid to give the boys thorough grounding in the practical operations of immediate utility to the farmer. Slight modification of the syllabus is under consideration of the Director of Agriculture to make the course more practical and precise in nature thus enabling the Head Masters to attempt definite things of practical nature more thoroughly than hitherto and make the course more appealing to the students and the Agricultural public. Gadar weaving with its adjunct rope-making as a minor industry is gaining popularity in all the Agricultural schools and arrangements to teach the subject more systematically are being made. Poultry keeping is being developed at Loni and Jambul Schools and attempts are being made to introduce it at Dhulia school as a majority of boys in these schools freely handle and make use of the birds in their houses. The small farms attached to these schools were worked by the boys in all cases. The boys of Godhra school had to exert themselves a good deal in bringing some of the remaining portion of the waste land under cultivation and much time had to be spent in doing this Good crops of cotton, Jowar, Maize, and tur are now grown in this land which was once considered by the local people to be useless for growing any crop. The

boys at Jambul school also have worked a good deal in developing the new garden area on the river *bank*. The boys of other schools also spared no pains in raising good crops. The crops on the Loni school land, which though Karl in nature has now been greatly improved, were much better than in previous years and the revised cropping scheme adopted during the year gave scope for better distribution of work and better rotation of crops. Devi-Hosur school grows varieties of dry crops and undertakes double cropping on rainfall and has a small garden area. Dhulia school though mainly growing N. R. Cotton in rotation with Jawar, Bajri and groundnuts is also attempting to grow garden crops for giving practice to boys in garden operations though the soil is not suited for the purpose.

Inspections and Examination.—As stated above, owing to some other duties, these schools could not be visited as frequently as was desirable. Owing to some slight disturbances at Godhra and Loni schools, the work at these schools suffered slightly. At Devi Hosur, owing to plague havoc for an unduly long period of time, the students had to be kept out and the students' studies were interrupted to some extent. The results of the annual examinations, however, show fairly satisfactory results in spite of the above difficulties, except in the case of Dhulia and Godhra schools. The results of the different schools are as given below :—

Schools	First year boys appeared and passed		Second year boys appeared and passed		Teachers under Training appeared and passed		Remarks
Loni School ..	26	24	16	16	7	7	
Devi Hosur School ..	15	11+3	15	14	7	7	Eleven passed and 3 though failed, promoted.
Dhulia School ..	16	10+3	16	13	..	..	Three promoted though failed.
Jambul School ..	22	15+3	9	7	3	2	Do.
Godhra School ..	9	6	14	11	5	4	
Surat School ..	14	12+2	17	15	..	..	Two promoted.

It is noticed in general that the students are weak in the knowledge of crops and have no definite information. In the case of 1st year boys, it is noticed that they are weak in putting on paper whatever they know as they probably have little practice of answering papers in writing. Oral examinations in subjects like Agriculture and Botany in addition to papers may be found useful in the case of these boys. In other respects, they are fairly upto the mark.

Agricultural bias classes.—These classes, it will be remembered are attached to primary schools with a view to create and faster love for manual pursuits and prepare the minds of rural boys for agriculture, little attempting at definite vocational instruction, for which there are special agricultural schools of the type of Loni school. There are 54

of these classes at work (as it stood at the end of March) 7 in Sind and 47 in the Presidency proper distributed as under :—

Southern Division (including Karwar)	..	14
Central Division (including Khandesh)	..	15
Bombay Division (including Nasik)	..	8
Guzerat Division	..	10
Total	..	47

The total number of these classes should have now been 63. But owing to certain practical difficulties, all the classes have not yet been opened. Some more teachers have been, as usual, trained during the year for taking charge of new classes. And there is more demand for such classes in certain tracts especially so in the Karnatak and Khandesh where the District Boards have decided to get more teachers trained every year. There has been some difficulty in Konkan tract where these classes have not appealed to the people as people from this tract spend a major portion of the year in big industrial centres like Bombay and have no tendency to stick to agriculture all the year round. Besides Konkan villages being small in size and scattered in the hills and woods, the cultivators will have to send their boys to school situated at a distance from their village to which they are naturally averse. There are certain difficulties in respect of securing land for the school garden and securing proper teachers for these classes. The difficulty of securing proper teachers is to due to the absence of proper stimulus for work. With the teachers now available, one year's additional agricultural training will not suffice. Consequently the teachers trained are not properly equipped with the necessary agricultural knowledge so as to efficiently undertake the garden and other practical work.

Inspection and Examination of these classes.—Some of these classes were inspected at the time of inspection of the Agricultural schools. But as touring had to be cut short owing to other duties mentioned at the beginning of the report, many of these classes could not be visited at all. The District staff of the Deputy Directors of Agriculture in the different Divisions was entrusted with the examination of these classes. The results show fairly satisfactory work. The Vernacular Final Examination of the boys taking this course was held for the 2nd time in April 1927 and 14 schools sent 97 boys for the said examination of whom 53 came out successful. Figures from 4 classes have not been received. Arrangements for a Special Training College for Marathi speaking boys are being made this year, as the number of Kanarese and Gujarathi students is not sufficient to justify the opening of a Special Training College for them for the present.

General.—The movement is getting popular in rural areas and deserves to be persevered with and a more generous help from Government in pecuniary and other matters is necessary as the District Boards with their limited resources can't develop the movement as rapidly as is desirable. Besides some common arrangement so as to cordinate the

efforts of the different District Boards and help them for proper working of these classes seems necessary. A special Officer of Government for each of the different Linguistic Divisions working in consultation with the Agriculture Department for technical advice and help will go a great way in developing the movement as it can't be solely left to the District Boards, which are new to this line of work.

R. Y. HULKOTI,
Ag. Inspector of Agricultural Schools,
Bombay Presidency, Poona.

28th July 1927.

APPENDIX S

Summary of Work of Agricultural Propaganda in North and Middle Sind, under the Assistant Registrar of Co-operative Societies, Sind, for the year 1926-27

I remained in charge of the Agricultural Propaganda work throughout the year in addition to my duties as Assistant Registrar, Co-operative Societies, Sind and my activities were confined to the same 11 Talukas as last year, *viz.* :—

North Sind—

1. Sukkur.
2. Ghotki.
3. Larkana.
4. Kambar.
5. Shikarpur.
6. Mirpur Mathelo.

Middle Sind—

1. Hyderabad.
2. Halla.
3. Tando Allahyar.
4. Shahdadpur.
5. Matli.

Propaganda Staff

There was no change in the numerical strength of the propaganda staff during the year. Mr. Lokram assisted by three District Agricultural Overseers remained in charge of the six Talukas of North Sind, while Mr. Mahomed Bux with two Overseers continued in the remaining five Talukas of Middle Sind.

Season

During the early part of the year under report, *i.e.*, April to June 1926, the Rabi crops of the preceding year were harvested and sold. The innundation of 1925 having been very poor and water having broken off by the middle of August 1925 there was not very extensive Rabi cultivation. Whatever little had been gone in for, however, yielded a fair out turn partly because there were timely showers of winter rains and partly because there was no frost in January or February 1926.

As regards Kharif of 1926-27, the season opened with rather gloomy prospects. The river did not rise before the 15th of July 1926 and hence most of the agriculturists had to reduce considerably the areas under cotton and paddy cultivation and substitute instead, cereal crops like *juari* and *bajri*. The late innundation was followed by copious rains which though very helpful to the growth of wild grass, affected the Kharif crops adversely. There appeared the boll worm in cotton, while the cereal crops were rendered *khasa* (poor in yield). When the surviving crops were well nigh mature, a fresh calamity visited them *viz.*, the ravages of the locusts, which ate away a good portion of the standing crops. To give a final blow to the agriculturists the price of

cotton also went down at harvest time to a very low pitch. The year under report was thus very unfavourable from the agricultural stand point.

Crop-pests and Animal Disease

The season has a peculiar record for crop-pests. In middle Sind the cotton crop was greatly damaged by the boll worm. The mango and wheat were affected by *mahlo* and *rati*. In North Sind Sugar-cane and *juari* were badly affected by the Borer. Amongst animals, foot and mouth disease broke out furiously and many animals fell a prey to its ravages but fortunately the disease was not fatal in its character.

Summary of General Progress

With a view to ascertain with some degree of accuracy the material effect of Co-operation and agricultural Propaganda upon the agriculturists, the Divisional Co-operative Institute of Sind had appointed a Committee to hold an economic enquiry in three villages of Deh Sipki Taluka Hyderabad (of propaganda area) relating both to members and non-members of societies. A copy of the Committee's report appears already to have been furnished to the Director, but two extracts pertaining to the progress made by the agriculturists in the spheres of Co-operation and agriculture are herewith appended. It will be observed from the extracts that in one village (Khudabux Junejo) the area under cultivation has increased by 20 to 25 per cent. As regards cotton, the area under it last year was 45 per cent. while six years ago it did not exceed 33 per cent. Regarding increase in the yield of produce the enquiry report shows that while 10 years ago the yield of cotton per acre was less than 6 maunds and that of *bajri* only 6 maunds, the agriculturists have by adoption of dry ploughing and judicious manuring and by the use of modern implements been able to increase the produce of cotton to 10 maunds and that of *bajri* to 9 maunds per acre. The agriculturists knew the benefits of dry ploughing and manuring long ago but they expressed to the enquiry committee that they had no funds before to manure their soils or effect improvements. The report further says that the village society finances the members to the extent of 87 per cent. of their total cash requirements, and by cash payment they get pure and good seed. Before the advent of Co-operation the small *khatedars* and tenant managers, got seed on credit which was generally of an inferior quality. With the money provided by societies the agriculturists can purchase draught animals, implements and seeds of better quality. The report goes further to say that the villagers have become more business-like and majority of them are thrifty. They have increased their holdings and live-stock. From the enquiry Committee's report it will be observed that there has been considerable progress in the material prosperity of the agriculturists after the advent of Co-operation and the intensive propaganda work done amongst them.

Popularization and Distribution of Seed

The importance of seed selection cannot be over estimated. A very serious effort is being made to impress upon the Zamindars the

desirability of picking out the best and pure ear-heads just before or after the crops are harvested. Similarly in the case of cotton they are advised to pick out the best *phuties* and preserve them for seed. The advantages of the practice are :—

1. That it is the cheapest way of getting excellent seed.
2. There is an amount of inner satisfaction that the seed is pure in quality.
3. The practice if adopted from year to year sustains the purity of the seed.

Pusa 12 Wheat

Pusa 12 as an irrigated crop has acquired great popularity in North Sind specially in Sukkur and Ghotki Talukas and about 60 per cent. of the cultivated area is commanded by it there. The Inspector North Sind reports that the total area sown under Pusa 12 last *rabi* was not less than 20,000 acres.

Experience has shown that Pusa 12 is very delicate and cannot withstand frost specially that sown under *bosi* conditions. The one great point, however, in its favour is that it ripens earlier than local varieties. It was found to ripen simultaneously with local varieties (sown in about October or November) even though it was sown as late as by the Middle of December.

The Pusa 12 seed has been thoroughly popularized and people are sowing it wherever there are chances for its success. Most of the zamindars desirous of sowing the seed either preserve their own stock or purchase it direct from good and reliable growers. Some of them were very anxious to have still purer seed from the Government Farm and accordingly 400 maunds were obtained from the Jacobabad Farm and distributed amongst Zamindars of North and Middle Sind in equal proportion.

In order to ascertain whether the increased yield from Pusa 12 was due to its intrinsic merits or to the great care that was being taken to keep it pure and well graded, about 20 maunds of selected strains of Phundni and Thori were secured and sown side by side with Pusa 12. Final results of the experiments have not yet been received.

27 W. N. Cotton

Of the Desi strains of cotton 27 W. N. is appreciated the most both by the factory owners and agriculturists for better yield and greater percentage of lint. During the year under report 2,530 maunds of 27 W. N. variety were distributed amongst selected growers of Middle Sind for multiplication as under :—

Taluka Hyderabad	..	1,000	maunds.
,, Tando Allahyar	..	1,400	,,
,, Shahdadpur	..	50	,,
,, Halla	..	50	,,
,, Matli	..	30	,,
Total	..	2,530	maunds.

One thousand five hundred and thirty maunds of the above quantity had been secured directly from the growers to whom 27 W. N. cotton had been distributed during the previous Kharif for multiplication, while the remaining 1,000 maunds had been obtained from the Agricultural Department.

The Agricultural Staff was as usual engaged to watch the progress of the crop at various stages and obtain opinion of the local zamindars. The percentage of germination was very satisfactory and the growth of the plants was admitted by the agriculturists to be much more rapid than that of the ordinary plants. The percentage of mixture was reported to be hardly 5 per cent. and prompt measures were suggested for the removal of foreign plants to sustain as far as possible the purity of the seed. The adverse conditions of the climate in the end, locusts and boll worm attacks, however, affected, like others, the N. R. cotton very adversely and hence it did not become quite possible to collect a large quantity of this seed for further multiplication.

27 W. N. cotton in North Sind

Cotton hitherto was altogether unknown in North Sind but for the first time 36 maunds of this variety had been distributed there experimentally. Sardar Dadan Khan Lund had sown about 30 acres with this variety last Kharif. The plants came out splendid and had been very much appreciated by Dr. Mann. But owing to diseases like the wilt and white-ants coupled with unfavourable climatic conditions and locust attacks, the results so far have not been very encouraging to the people.

Bhitshah Cotton Seed

Next to the N. R. stands the Bhitshah cotton seed and 2,000 maunds of this variety were distributed in the undermentioned five Talukas of Propaganda area in Middle Sind :—

1. Hyderabad Taluka	..	1,000 maunds.
2. Tando Allahyar Taluka	..	400 ,,
3. Shahdadpur Taluka	..	100 ,,
4. Halla Taluka	..	200 ,,
5. Matli Taluka	..	300 ,,

As usual this seed also commands very good appreciation all round.

Berseem Seed

Berseem is a very valuable type of fodder and much appreciated by the Zamindars specially of Hyderabad Taluka. Twelve maunds of the variety were secured from the Deputy Director and distributed amcngst the zamindars on cash delivery system.

Sugar-cane (Striped Mauritius)

Striped Mauritius is a new variety of cane introduced specially for the purposes of Gul making which is carried on extensively in Sukkur Taluka. Its various qualities have been studied and its superiority over the local

Lahori cane from the point of Gul making has been proved. The area under cultivation of this seed is therefore steadily growing as in first year, *i.e.*, 1924, it was 1 Jareb, in 1925 9 Jarebs and in 1926, 42 Jarebs. The figures are encouraging enough when it is remembered that the total area under sugar-cane cultivation is only about 300 acres in Sukkur. During the year 4 maunds of striped mauritius seed were sent to Mr. U. B. Shivdasani for experiment at Hyderabad and 56 maunds of Lahori to Nawab Gaibikhan at Kambar. The results in both cases are awaited.

A new variety "Poona Pundia" was during the year ordered from Hyderabad and introduced in Sukkur Taluka. It is said to be good both for chewing and Gul making purposes. Definite results will be known later on.

Selected strains of local rice

Selected strains of some local varieties of rice, *e.g.*, Kangni, Jajai and Prong have been evolved on the Larkana Farm which are reported to yield 20 to 30 per cent. more than the ordinary types. Through the agency of the Co-operative Sale Society of Larkana about 200 maunds of the above varieties were secured from the Larkana Farm and about 200 maunds were secured from the zamindars to whom these seeds had been supplied last year. The seeds thus secured have been issued to selected growers of Larkana for cultivation during the current Kharif.

New seeds for garden crops

Some progressive zamindars were anxious to try rich garden crops in their gardens. The undermentioned seeds were therefore ordered from the Amalsad Farm near Surat and planted in their gardens.

Turmeric	.. .. ..	695 lbs.
Ginger	.. .. ..	5 ,,
Suran	.. .. ..	5 ,,

Germination has been fairly satisfactory, so far.

Popularization and sale of implements

The following table shows the number of implements sold during the year through the agency of the Taluka Development Associations.

Name of implement	Number sold in North Sind	Number sold in Middle Sind	Total
1. Sirkar Plough	226	327	553
Steel shares	6	....	6
2. Chatanuga Plough	15	1	16
3. Meston Plough	9	32	41
4. Scrapers	5	2	7
5. Clod crushers	3	2	5
6. Sugar-cane mills	3	....	3
7. Hand Screws	53	10	63
8. Monsoon Plough	....	8	8

The above figures are not exhaustive. The local carpenters and merchants are also selling on a large scale the implements, direct to the agriculturists and no record is kept thereof.

The various types of plough recommended by the Department have been sufficiently popularized. The Egyptian Plough while it commands the greatest appreciation for soft and irrigated soils it is useful in hard and dry soils only in the second ploughing. In Middle Sind the Meston plough is also gaining in popularity.

Amongst the other types, the Monsoon and the Chatanuga ploughs are getting the better of the Raja plough which is very costly.

Demonstrations

In order to carry home to the zamindars the superiority of our implements the Kamgars of the various Associations carry on village to village demonstrations with their own implements and pairs of bullocks. The implements shown to have been sold in the above list are the direct result of such demonstrations. The number of villages thus visited was 367 during the year.

In order that the agriculturists may be convinced of the advantages of dry ploughing, plots of their own lands were ploughed partly on rent and partly gratis. 695 Jarebs and 15 Gh. were thus ploughed and the rent realized was Rs. 657-6-0.

The advantages of dry ploughing have very well been appreciated and it could be said with confidence that about 60 per cent. soil of the propaganda area in North Sind is being thus ploughed in the dry state. Some of the most enlightened zamindars who were doubtful about the efficacy of dry ploughing have, after personal observation, been convinced thoroughly of it, and they do not now give their lands to the Haris for cultivation without obtaining a promise from them that they will plough the land after harvest.

Improved methods of rice cultivation

The advantages of earlier transplantation of rice seedlings and sowing of rice at reduced seed rate have been discussed at great length in my previous notes and reports. The people have appreciated and understood them thoroughly and have adopted the suggestions to a very great extent. With regard to earlier transplantation of seedlings, however, the Agricultural Inspector reports that the late innundation of the last 2 seasons has shown that it is not advisable to sow the seeds on wells before the 1st of June. Accordingly the agriculturists have been advised to pay particular attention to this suggestion.

Taluka Development Associations

Last year there were 14 Taluka Development Associations and early in April 1926 one more, *viz.*, the Shikarpur Taluka Development Association was registered bringing the total No. to 15 which continued unaltered right up to the end of the year under report.

Eleven of the Associations pertain to the 11 Talukas of the Propaganda area assigned to me, *viz.* :

Middle Sind :—

1. Shahdadpur.
2. Halla.
3. Hyderabad.
4. Tando Allayar.

North Sind :—

5. Sukkur.
6. Ghotki.
7. Mirpur Mathelo.
8. Shikarpur.
9. Larkana.
10. Kambar.

Lower Sind :—

11. Matli.

Three pertain to the 3 Talukas of the Jamrao tract, *viz.*, Digri, Jamesabad and Mirpurkhas assigned to the Deputy Director of Agriculture for intensive agricultural propaganda work. One Association, *viz.*, the Malir Taluka Development Association has been organized by the agriculturists of the Malir tract.

Each Association of the propaganda area maintains a depôt of implements, a trained Kamgar, a Supervisor and a pair of bullocks. The Kamgar holds demonstrations of implements and carries on dry ploughing work under the supervision of the Departmental Overseer and the Inspector.

The sale of seeds and the distribution of implements, referred to in this report is all carried on through the agency of the agricultural associations and so also the agricultural improvements.

The 11 Associations of the Propaganda area were all visited by the Registrar and Dr. Mann and they both were well satisfied with the work done. The Kambar Taluka Development Association organized a big agricultural show at Kambar in January last under the presidency of the Registrar wherein 62 varieties of paddy seed were exhibited. Fifty-eight of the exhibits came from *bona fide* zamindars. The special feature of the show was that each variety of seed exhibited was at least a bag of 2 maunds. This was insisted upon with a view to prevent mischief which might have been possible if small quantities of seed had been accepted. The exhibitors of the approved seeds were awarded *lungis* and certificates, the aggregate cost of *lungis* being Rs. 115. The number of agriculturists present in the exhibition was over 1,000. Similar exhibitions were also organized at Chandia and Mahota villages of Larkana Taluka in December and January last respectively. The former had been attended by Dr. Mann and the latter by the Registrar.

During the malarial season the Taluka Development Associations of Tando Allahyar, Hyderabad, and Matli distributed Quinine free amongst the agriculturists at large. The Tando Allahyar Association

had sanctioned Rs. 200 for the purpose. The other Associations distributed the quantity received by them from the District Local Board in addition to one pound sanctioned by each one of them. The boon has been very well appreciated by the masses.

The Tando Allahyar Association also arranged with the Public Works Department officials for clearing the silt from the mouth of one Khesano canal. The Association Supervisor and Kamgar were deputed to assist in the work with a large number of people who were interested in the flow of the canal.

Extract of pages 11 and 12 from the Economic Enquiry Report regarding Khuda Bux Junejo Co-operative Society of Deh Sipiki, taluka Hyderabad

Results achieved by Co-operation.—It is not possible to estimate accurately the economic gain of the village since the opening of Co-operative Society. It is claimed that :—

(1) More land has come under annual cultivation. This may be ascertained from the Revenue Record for the whole Deh but there is no means of finding this for this village only. From the general enquiries made by us the area of cultivation by the residents of the village has increased by 20 or 25 per cent. in 6 years.

(2) More area comes under cotton cultivation. For the last year, our enquiry shows 45 per cent. under cotton, it is asserted by the Khatedars of the village that 8 years ago the cotton area did not exceed 33 per cent. In 1926-27 however owing to fall in the cotton price during the previous year there has been a decrease in cotton cultivation.

(3) By adoption of dry ploughing long before cultivation and judicious use of manure, the yield of soil has increased. We are told by the cultivators that although they were aware of the benefits of dry ploughing and manure, they had not sufficient funds at their disposal for better tillage and purchase of manure. It is said that the average yield of cotton was less than 6 maunds and of Bajri about 6 maunds per acre, ten years back.

(4) By cash payment they now get pure and good seed whereas before the advent of Co-operation, the small Khatedars and tenant managers got seed on credit, of an inferior quality. Similarly they can purchase draught animals of better quality, with cheaper credit provided by Co-operation.

(5) The saving under interest, assuming that the borrowing from a society amounted to the same figure, *i.e.*, Rs. 6,500 is roughly Rs. 650 per annum. The Waderas paid the Sowkars a minimum interest of 20 per cent. but the small khatedars and managing tenants paid from 25 to 37½ per cent. before coming into the Co-operative movement.

(6) They have become more business-like and majority of them are thrifty. They have increased their holdings and live stock as detailed above.

Extract paragraph last of page 10 from the Economic Enquiry Report regarding Khuda Bux Junejo Co-operative Society of Deh Sipiki, taluka Hyderabad

" *Debts.*—the loans borrowed from the Co-operative Society amount to Rs. 5,213 by Khatedars and Rs. 1,285 by tenants, total Rs. 6,498. Those borrowed from Sowkars amount to Rs. 760 in case of Khatedars, and Rs. 242 in the case of tenants total Rs. 1,002 showing that the society finances the villagers to the extent of 87 per cent. of their requirements which is satisfactory. "

AZIMKHAN,
Assistant Registrar,
Co-operative Societies in Sind.

APPENDIX T

Summary of the Work done by the Professor of Agricultural Economics during the year 1926-27

This was the second year of the section, the post of the Proifessor of Agricultural Economics having been created by Government n 1925. I continued as Professor of Agricultural Economics throughout the year except from 2nd May 1927 to 30th June 1927 when I was on leave. During my leave no substitute was appointed and my assistant Mr. T. G. Shirname, B.Ag., Demonstrator in Agricultural Economics was asked to carry on the work under instructions and orders of the Acting Principal of Poona Agricultural College.

Mr. T. G. Shirname, B.Ag., continued to be Demonstrator in Agricultural Economics.

Mr. T. B. Pawar, B.Ag., Graduate Assistant in training continued to be under me for district work.

Lines of Work

The work of my section chiefly consists of (1) teaching and (2) collecting information bearing on Agricultural Economics and marketing of farm produce and other investigation bearing on business side of agriculture.

Considerable time of the section was taken by the Presidency Agricultural Show as I was on the Executive Committee and on the various sub-committees. I was the secretary of the Marketing, Rural Education and Lecture sections; the marketing section was entirely under me. With the assistance of the meagre staff at my disposal, the section was successfully organized. The charts and maps in the organization and marketing sections of the Show were almost all prepared under my guidance. The collecting of samples, information and preparation of illustrations for the marketing section made a heavy drain on the time and energies of myself and my two assistants.

(*1*) *Teaching.*—This was the first year of the revised course of the Bombay University for Agricultural Examinations. Out of 51 students of the senior B.Ag. class, 9 had taken Agricultural Economics as their special subject and of these, 5 passed their B.Ag. examination while the remaining 4 pass in Agricultural Economics and got exemption in that subject. The junior B.Ag. class which consisted of 65 students and the senior B.Ags. 51 in number, were given lectures in compulsory Agricultural Economics, Land Tenures, Book-keeping and Accounting, Marketing and Co-operation which form the subject-matter of one of the four compulsory papers for B.Ag. examination.

I also gave lectures on co-operative marketing to the Supervisor's class held at Poona under the auspicies of the Central Co-operative Institute, Bombay.

(2) *Collecting information bearing on Agricultural Economics, Marketing of farm produce and other investigation bearing on the business side of agriculture.*—This work is conducted through the following different agencies :—

(*a*) My personal work.
(*b*) Work done on the river Warna through a temporary man.
(*c*) Work done through a Graduate Assistant attached to my office.
(*d*) Work done through two graduates belonging to the Deputy Directors of Agriculture, N. C. D. and S. C. D. in addition to their usual work.
(*e*) Work done through the five Agricultural teachers at the Agricultural Bias schools in N. C. D. and S. C. D.

(*a*) Good deal of material on marketing of gul, groundnut, and cotton is collected by enquiries and occasional visits to certain markets.

(*b*) Work done on the river Warna through a temporary man :—Careful study of the costs and receipts of six partnerships engaged in growing sugarcane is made. Separate report of this work will be submitted.

Labour income per day per man for the working days comes to about 2·9 annas on the river where water is lifted by a series of four or five motes.

The labour income is materialy affected by the variation in yields and prices of gul. It is suggested that the yields may be studied for two years more.

(*c*) Work done through the Graduate Assistant :—The Graduate Assistant in training continued the work of finding out the cost of production of staple crops at Nanded, Pimple (Sathyache), Wagholi, Loni Kalbhor and Shahajpurwadi all in Poona District. He obtained his figures by paying weekly visits to all these places except the last where frequent visits were not found necessary as one of the local cultivator there had agreed to keep record of costs. The data on cost of production collected during the year 1925-26 have been consolidated and submitted to the Director of Agriculture.

Figures for the year 1926-27 are being worked out. The work will be continued.

(*d*) Work done through the Graduates at Mumrabad (near Jalgaon) and Belapur.—Each of the two graduates were asked to submit careful returns of one average farm. The area, number of members in the family, cattle, costs and receipts were to be studied. The work at Belapur commenced very late (*i.e.*, in December 1926); moreover the Overseer was on leave for about two months and later on he is transferred and hence I could not get all the data I wanted.

The work at Mumrabad was commenced in time and fairly sufficient data is received; unfortunately this man is also sent on deputation from the middle of April 1927 and his work is also stopped. The labour income of the Mumrabad farmer and his wife on a farm of 32 acres and 27 gunthas and on two bullocks came to Rs. 182-10-0. The

land belonged to him. Rent for the land and interest on the capital invested is not included in the costs. The rent of land in this locality varies from 15 to 20 rupees per acre.

This line of work is interesting and it is requested that it may be continued care being taken not to disturb the man in charge, if possible, till the year's work is completed.

(*e*) Work done through the bias school teachers :—Two of the bias school teachers are sending returns showing how the time of the members of a farmer's family and of his work-cattle is utilized throughout the year. Each of the two teachers have selected one average family for their investigation.

This work is intended to find out when the farmer has leisure and how it could be utilized.

The remaining three are studying the cost of production of the local staple crops.

(*3*) *Publications.*—During the year under report I have submitted the following bulletins for publication :—

(*a*) Sugarcane mills and small power-crushers in the Bombay Presidency.

(*b*) Furnaces in the Bombay Presidency. This includes my researches on furnaces.

(*c*) Organization of Gurhal labour in the important sugarcane growing tracts of Bombay Presidency.

I have got two more bulletins on hand.

College of Agriculture,
Poona, 18th July 1927.

P. C. PATIL,
Professor of Agricultural Economics.

APPENDIX U.

The Origin, Plan and Progress of the Sakrand Agricultural Research Station, Sind

With the adoption of the Sukkur Barrage Scheme and the enormous increase in the irrigated area in Sind which will result from its completion, a whole series of new agricultural problems will arise in the province, the solution of which cannot be certain from what has hitherto taken place either in India or in any other part of the world. This was anticipated from the beginning, and will apply to almost every part of the area which is expected to be commanded by perennial water. But the area in which the results of the application of such perennial water are most uncertain is that very large portion of Central Sind, hitherto either receiving no water at all, or receiving water in the inundation season only, mostly by lift from canals or their branches.

While, therefore, it has been felt that investigations into the agricultural results of the application of perennial irrigation water, and the methods required to make this a success,—are needed in every section of Sind which will receive the new supplies of water, yet the most urgent need seems to be in this very large area, supplied from the Rohri canals, now under construction, in the Khairpur State, and in the Nawabshah and Hyderabad districts.

The scheme for the utilisation of the water in this area which has been adopted as the basis for the future is known as the "Baker-Lane" Scheme and was issued in its complete form in 1919. It provides for a complete revolution in the agriculture of this area, in at least the following three particulars :—

1. Whereas in the past, only about one-third of the area, which was in a condition to be cropped, was put under cultivation each year, the new scheme proposed that four-fifths (to be accurate, 81 per cent.) of the commanded area should be under crop each season. This practically does away with the system of fallows which are the basis of present agriculture in this part of Sind.

2. Whereas in the past, the supply of water has been limited to the inundation season, and hence only *kharif* crops (*i.e.*, cotton, *bajri*, *jowar*, etc.) have been possible,—it is proposed to put two-thirds of the cropped area each year under *rabi* crops (largely wheat) and the remainder only under *kharif* crops.

3. Whereas, hitherto, except near the tails of the canals, the water has been chiefly supplied by lifts worked by camels or bullocks,—in the future the water supplied will be *by flow*, and will be poured direct on to the land.

It may be suggested that what is essentially the same agricultural revolution as is proposed in Sind, has already actually taken place in the Punjab, and that the canal colonies there, working on a system not widely differing from that proposed, are now among the most flourishing parts of India. This is so, but there are a number of matters in which

the analogy is by no means perfect, and which may make the Sind problem a more difficult one. These are as follows :—

(1) The areas in question in Sind are very much more deltaic than those in the Punjab, that is to say, they have a much more stiff and compact soil, far less easily drained than is the case in the greater part of the Punjab colonies.

(2) The areas in question in Sind have sub-soil water, sometimes fresh and sometimes salt, already, at a depth of from twenty-five to forty feet, and therefore, it may be far more eas ly liable to cause water-logging of the lower areas, if large quantities of additional water are turned on to the land.

(3) The soil throughout is highly impregnated with salt, the quantity being very considerable even in the areas where cultivation is already carried on, and it will not, in the more compact soils, be possible to remove it so easily as in the lighter lands to the north.

(4) Experiments made, hitherto, at Mirpurkas and elsewhere in Sind where perennial water has been available, have suggested that under a system of cropping such as is proposed, the fertility of the land will rapidly decrease,—unless large amounts of manure are available. Such large amounts of manure will only be available if the proposed scheme of cultivation is altered,—and if animal husbandry forms a much larger part of it than has been expected, *or* if recuperating crops like berseem are grown to a much greater extent than is at present proposed, necessitating in many cases *two* crops a year on the land, and not only *one* as is proposed in the Baker Lane Scheme.

It was from considerations such as these that a Committee in Karachi early in 1924, presided over by the then Commissioner in Sind (Mr. J. L. Rieu) recommended the establishment of a first class agricultural research station in this area, where perennial water could be already obtained, and which was in a representative situation,—to examine and investigate, in advance of the supply of water, some of the points already raised, and at the same time try and lay out the methods which will enable this area in the future to be cultivated to the best advantage, having regard to the proposed conditions of water supply. Many difficulties intervened in the carrying out of this recommendation, but the site recommended by the above committee at Sakrand was, ultimately, made available, the land was cleared of jungle and arrangements for a pumped water supply were made in the latter part of 1925 and early part of 1926, and crops were grown in the *kharif* and *rabi* seasons of 1926-27.

The land available for the experimental station at Sakrand forms a tongue of high land adjacent to the Sakrand *dhand* or lake, which being filled with water from the river Indus during the inundation season, normally retains at least a certain amount of water throughout the year, and forms the main source of water for the contemplated agricultural station. The entrance channel for the water has been improved and a regulator constructed and it was estimated by the Irrigation

Department that it would be possible to rely on getting a supply of water from the river in each year by June 1st. In 1926 and again in 1927 this has not been the case, no water being received in the former year until July 15th. This water is then used by pumping, for which two steam engines are provided, each of 14 to 19 B.H.P. The *maximum* lift from the *dhand* to the distributing tank is 38 feet. The water is very soft and is practically free from silt throughout nearly all the year.

As a resource in case the supply of water fails a tube well has been constructed on the station, the boring made being twelve inches in diameter. Water was struck at 29 feet from the surface, and the boring was continued, in sand, to 140 feet. There is now 80 feet of strainer, recuperation is excellent, and a centrifugal pump placed 28 feet below the ground gives a regular supply of 300 gallons of water per minute without difficulty.

The analysis of the *dhand* water and of the tube well water has given figures as follows :—

	Sakrand Dhand Water (29-10-26)	*Tube Well water at Sakrand* (30-6-26)
	Parts per 100,000	Parts per 100,000
Total solid matter	17·2	43·6
Calcium Carbonate	5·8	22·4
Calcium Sulphate	4·1	..
Magnesium Carbonate	..	3·8
Magnesium Sulphate	3·9	8·5
Magnesium Chloride	0·7	..
Sodium Carbonate	1·9	..
Sodium Sulphate	..	0·7
Sodium Chloride	0·3	4·7

Such is the water supply which will enable us to imitate the conditions as they will prevail under the Sukkur Barrage, in Central Sind. The land itself extends to 234 acres, and is all above the present highest inundation level. A portion has been occasionally cultivated, by lift, from a channel from the Dad canal, and at the highest of the inundation the minimum lift ha. been about 13 feet. Most of the land, however, has never or very rarely been cultivated and was covered with somewhat thick jungle, chiefly *kabhar* or *jhar* (*Salvadora*), *kandi* (*Prosopis spicigera*) and *khirir* (*Capparis aphylla*).

The more I see of this land, and compare it with the very large areas of waste land in Central Sind, the more I feel that it is a very typical site, and that methods and crops which succeed here are likely to succeed over very large areas, and the difficulties which arise here are those which are likely to be found in the greater part of the country.

The soil, as almost every where in Central Sind, is a fine alluvial silt. It drains with fair ease, but only slowly. All over, it contains a good deal of salt, and in some parts so much as to make it unfit for growing crops. A careful, though rough, survey puts the proportion of the

agricultural station which is too salt to grow crops without special treatment at 29 per cent. It has been suggested that this is higher than is generally found in the waste lands of Central Sind. On this point it is impossible to say,—for no one knows in advance of a regular survey. Unless the presence of salt (*kalar*) is *very* pronounced, it is impossible to judge of its amount or of its importance in any particular area, without an actual analysis, or until irrigation is actually applied. As this is one of the main features determining the value of these waste lands, any system of classifying them without making such analysis leaves out one of the very large elements which determine their fertility.

One point seems very striking. It is nearly always the highest land which is the most salt, and though there are variations almost every yard, yet the lower lands are, in general, those which are most easily brought under regular cultivation. I will return, however, to this point later.

The Baker-Lane Scheme of Irrigation

Such is the land on which the Baker-Lane scheme of irrigation for the Rohri Canals area is to be tried, and it is necessary, before going further to describe in somewhat greater detail, the plan which is proposed for cultivation under that scheme.

In Central Sind, every area of land under command of the canals will be divided so that in any year—

(*a*) 19 per cent. of the land will be fallow or not under agricultural crops. This includes the land under buildings, roads and channels.

(*b*) 27 per cent. of the land will be under *kharif* crops.

(*c*) 54 per cent. of the land will be under *rabi* crops.

There will be exceptional cases where actual perennial crops will be grown, where fruit will be cultivated, and the like, but over the bulk of the area the above is the general plan.

Thus, except for the area which does not in any year receive water, all the area will be under *one* crop each year,—two-thirds being under *rabi* crops and one-third under *kharif* crops.

Now, in Sind, as is well known, cultivation is entirely dependent on irrigation water. There is occasional rain, but it cannot and is not taken into account as a serious factor in growing or the maturing of crops. Hence, the water available for irrigation purposes determines both the character and the extent of the cropping. In the present case, the Baker-Lane scheme provides for certain amounts of water for each class of crop. Thus :—

(*a*) One cubic foot per second of water (one cusec) flowing continually at the outlet from a canal or distributary into a field is supposed to be enough to ripen 50 acres of rice in the given season.

(*b*) One cubic foot per second of water (one cusec) flowing continuously at the outlet into a field is supposed to be enough to ripen 100 acres of *kharif* crops.

(*c*) One cubic foot per second of water (one cusec) flowing continuously at the outlet into a field is supposed to be enough to ripen 200 acres of *rabi* crops.

The meaning of this is not perhaps very clear, and I will try and make it more intelligible. If a rice crop is on the ground four months, the amount of water allowed for it will be 56 inches deep spread over for the whole area. This is of course put on in small amounts daily at first, then every second day, and then finally every five days. But the total water it is estimated under the above scheme to require would form a depth of 56 inches over the whole of the land. There is, however, very little rice to be grown under the Baker-Lane scheme in Central Sind. Other *kharif* crops, of which the most important will be cotton, *jowar* and *bajri*, are allowed half the above amount or a depth of 28 inches of water over all the area, again allowing four months for ripening,—while *rabi* crops are supposed to need a depth of 14 inches of water to bring them to maturity.

The scheme I am trying to describe does not specify the amount of this water that should be given at each dressing. Only the total quantity is specified, but in making it the basis of any attempt to judge of cultivation under the Sukkur barrage conditions, I have taken the following as a standard method of application.

1. Rice (4 months crop) 4 inches of water before transplanting, 2 inches on the same day after transplanting, 2 inches on each of the succeeding three days, 2 inches on every alternate day for six days, and thereafter nineteen dressings of 2 inches of water at intervals of five days (total 56 inches). This, of course, excludes entirely the water required for seed beds.
2. Ordinary *Kharif* crops (4 months crop) 4 inches of water for soaking the land before final ploughing, 2 inches before sowing, and 2 inches thereafter at intervals of ten days when needed (total 28 inches).
3. *Rabi* crops (4 months crops) 4 inches of water for soaking the land before final ploughing, 2 inches before sowing, and a further 2 inches at intervals of twenty days when needed (total 14 inches).

The actual method of application is simply arranged to make a standard, against which the necessities of any crop can be compared.

Purpose of the Sakrand Station

I have thus indicated the kind of land and the amount of water that will be available in Central Sind under the Sukkur barrage scheme, and it would be the purpose of any experimental station that is established in this area to try and obtain reliable information on a series of questions to be answered which were defined by the Committee which sat on the subject early in 1924, as follows:—

1. The best rotation of water to give the maximum duty for the water without damaging the land either by the production of *kalar* (salt) or otherwise. In this connection the use of water for the cultivation of leguminous crops may be emphasized.

2. The best rotation or series of rotations of crops which will enable the maximum returns to be got from the land without damaging it, while at the same time maintaining its fertility.
3. The production of the types of crops which will give the best results and maximum returns under the barrage conditions, especially types of improved cottons, and the methods of ensuring that these shall be grown in the best possible manner.
4. The best way in which the land can be tilled under the new conditions, whether by cattle or otherwise. If by cattle, the chief problem is as to how the necessary fodder for the cattle can well be produced when the waste land available is largely reduced. If otherwise, then how far can the necessary manuring of the land be done in the absence of cattle or with a largely reduced supply of cattle.
5. The best methods for preventing the development of salt (*kalar*) in the land, the best methods of utilizing land containing a limited amount of salt, and the reclamation of salt land.

It is quite obvious that an extensive programme like this can only gradually be worked up to, especially when the agricultural station where it is to be done has only just been taken out of jungle. Hence in the period under report, attention has been concentrated on three problems which were defined at the end of 1925, as follows:—

1. To determine the crops and types of crops which can best be grown under the conditions which will prevail under the Sukkur Barrage in Central Sind.
2. To determine the rotation of crop and of water which will best suit the circumstances.
3. To study the effect of the watering proposed under the Sukkur Barrage on the development of salt.

Now, at the end of a period of work, including one *kharif* and one *rabi* season, and a portion of a second *kharif* season we can say something with regard to the first of these lines of investigation and a little with regard to the other two.

In order to bring the Baker-Lane scheme into operation, it was necessary to divide the area which could be dealt with into three parts, two of which will, when the station is fully developed, be each year under a *rabi* crop and lie unoccupied through the *kharif* season, and one of which will each year be under a *kharif* crop and lie unoccupied in the *rabi* season. Two of these areas, one *kharif* and one *rabi*, have been brought under cultivation in 1926-27, and the third will be under a *rabi* crop in the season of 1927-28. The land for all these crops, which was very largely under heavy jungle whose removal was necessary, had to be cleared, and fully canalised, so that the water given to any area could be at least approximately determined. It was then ploughed throughout with a motor tractor* to a depth of eight to ten inches before being finally laid out in plots for irrigation, of one-eighth of an acre each.

* It may incidentally be noted that the actual running cost per acre of tractor ploughing to this depth, in dry soil, was Rs. 4-9-7 per acre. Counting depreciation, I take it that this ploughing cost Rs. 6-5-4 per acre.

Beyond this an area of 8½ acres was reserved for special experiments on the effect on the soil and crops of different methods of applying accurately measured quantities of water to the land, especially when the land contains much salt,—but these will be noted later.

Before describing the crops grown, and the conclusions reached, it may be stated that we have rejected all the methods for determining amount of water added to any piece of land, which depend on the use of a notch or module. Such methods are very approximate. Instead of these, we have used two systems. The first and most accurate, is the delivery of a definite measured quantity of water in a tank to a definite measured quantity of land, through a masonry channel. This method which is exclusively used for all experiments to determine the effect of quantity of water either on the soil or on crops, is very accurate and the water added to any piece of land is known within about 0·2 to 0·3 per cent. The other method is to add water delivered by one of our pumps at a known and measured rate for a definite time to a measured amount of land,—through a masonry channel as far as possible and then through an earthen channel for the remainder of the way. The amount added is thus less accurately known than in the former case, but is probably much closer than with any known notch or module.

In order to determine the suitability of land similar to that of which the Sakrand station consists for a variety of *kharif* crops, with the amount of water arranged in accordance with the Baker-Lane scheme, a large number of such crops were grown on what was largely virgin land in 1926. This put us in some difficulty as a portion of the land was found to be much more *kalar* than had been anticipated either by ourselves or by the surrounding cultivators. This shows how *only* the actual application of irrigation water will often reveal whether land does or does not contain too much salt for the healthy growth of crops. Unfortunately much of the land so affected had been set apart for cotton, but nearly all the other crops were successful with the limited quantities of water used.

Kharif crops of 1926

We will now indicate the *kharif* crops which were experimentally and successfully grown with the amount of water used, and any special difficulty met with in each case.

Rice.—Two acres of land were laid out for rice, on land which had never, so far as we know borne rice before. The varieties used were from Upper Sind (Larkana), namely, *Kangni*, *Dadkani*, *Prong*, and *Jajai* and were grown by transplanting, using selected seed from the Government Farm, Larkana. The watering given was according to the standard laid down (page 244) but as it was transplanted late, it ripened in less than the four months recognized for the crop. Three inches of rain was received during the growth, and the water actually received was thus :—

1.	By irrigation	44 inches.
2.	By rain	3 inches.
	Total ..	47 inches.

The seed was sown in seed beds on June 10th, and the plants were transplanted between July 15th and 21st. In transplanting single plants were used.

There were no difficulties in growing this crop with the amount of water indicated, and (on the virgin land) without manure. The crops reaped were as follows :—

Variety	Yield per Acre of Grain
Kangni	1,384 lbs. per acre.
Dadkani	1,572 lbs. per acre.
Prong	2,036 lbs. per acre.
Jajai	1,244 lbs. per acre.

These results, though in no way striking in point of yield show that under the conditions of Central Sind, and with less than the water supply provided for under the Baker-Lane scheme the best varieties of Upper Sind rices have grown without difficulty and yielded at least a fair crop. The relative shortness of the crop was, we think, largely due to the delay in sowing and transplanting and possibly, to the quantity of water being smaller than that usually given.

Jowar.—Jowar is classed as an ordinary *kharif* crop and hence is entitled to 28 acre-inches of water spread over four months. In the present case, the local *jowar* was used, and was sown on two acres, on July 23, 1926, after the preliminary waterings described in the standard system of page 244. The actual water received by the crop, including the preliminary soaking of the land was as follows :—

(1) By irrigation	15 inches.
(2) By rain	3 inches.
Total ..	18 inches.

As only 2½ months watering were required (the last dressing being given on October 1, 1926, and the crop reaped on October 21, 1926), the amount of water needed was considerably lower than the standard taken, but the crop never showed any sign of water deficiency.

The *jowar* crop reaped was as follows :—

	Yield Per Acre	
Variety	Grain	Kadbi
Local Jowar	2,220 lbs.	4,800 lbs.

This is recognized as an excellent crop, and showed that under the proposed barrage watering, this crop can be expected to yield first class results, at any rate on virgin land in Central Sind.

Bajri.—This crop is the common grain crop in the neighbourhood and is known to grow well. Local *bajri* was used, and thus it became a test as to what yield could be obtained with the regulated watering of the Baker-Lane scheme, on well prepared land. The crop was sown

on August 4th (decidedly late) and reaped on October 24th. The water received during this period was as follows :—

(1) By irrigation	..	12 inches.
(2) By rain	..	3 inches.
Total	..	15 inches.

The crop grew excellently, except for a few small *kalar* patches, and gave a yield as follows :—

(1) *Bajri* grain per acre	1,496 lbs.
(2) *Bajri* kadbi per acre	1,700 lbs. dry kadbi and 2,125 lbs. semi-dry kadbi equal to a total of 2,760 lbs. dry kadbi.

This crop compared with an average of 750 lbs. of grain per acre obtained by surrounding cultivators, on land exactly similar and equally new with the usual methods of cultivation and of lift water from the inundation canals, of which there was an abundant supply.

Maize.—Maize is not a common Sind crop, except in areas near Karachi as a fodder, but it seems one which has great possibilities in Sind, with a regulated water supply. Two types were, therefore, grown, one from the Deccan, and the other from Gujarat (Panch Mahals). Both were sown on July 23rd and the crop was reaped on November 10th to 12th, 1926. The water which the crop received was as follows, 4 inches of irrigation being given before planting and the rest (after the first) at ten days intervals :—

(1) By irrigation	..	16 acre inches.
(2) By rain	..	3 acre inches.
Total	..	19 acre inches.

The Deccan maize grew well, far better than that from Gujarat. The latter was neither tall nor luxuriant. The yield was as follows :—

	Yield of Grain per acre
Deccan Maize	1,200 lbs.
Gujarat Maize	430 lbs.

It is clear that this crop needs further investigation and careful selection of the most suitable variety for Sind conditions. Several types of maize including some from the Punjab are being tried in the season of 1927, and it is again obvious that some of these are more suitable than others, but it is equally clear that some of them have great promise for the barrage areas.

Castor.—Among the crops which seem to have considerable promise everywhere, owing to the rapidly increasing demand for castor oil, is castor, and there is a special opportunity in the barrage area in Sind, as the soil is exactly of the kind on which this crop flourishes. The crop is

hardly now grown in Sind, except as odd plants and as borders to fields, but one acre was put under castor in 1926, half being grown with seed from the Deccan and half with seed from Gujarat. The whole was sown, by dibbling seed, at three feet apart on August 13th to 16th, 1926, and the land was then watered with 4 inches of water. The sowing was very late, but the crop flourished luxuriantly from the beginning. It was watered at first every ten days (2 inches of water at each watering) and afterwards at longer intervals. The total water received by the crop was :—

(1) By irrigation	..	22 inches.
(2) By rain	..	3 inches.
Total	..	25 inches.

The first pods were ripe early in March, and reaping continued (once a fortnight) till the end of April 1927. The yield of clean seed obtained was 810 lbs. per acre with Gujarat castor and 758 lbs. per acre with Deccan castor. This is worth about Rs..7 per maund in Karachi or Rs. 69 per acre for Gujarat castor and Rs. 64-4-0 per acre for Deccan castor.

The crop shows promise of being very valuable, as the cost of cultivation was small, only one hoeing being given after the seed was sown, and no watering being required. Further, in 1927 it has proved itself a crop *very resistant to salt in the soil,* flourishing where a number of other crops have refused to grow. At present the discovery of such crops, which will grow in salt land without requiring excessive amounts of water, is a matter of great importance.

Tobacco.—There is a large future for tobacco in Sind when cheap water is available,—for the crop is already grown where well water can be had. On the other hand the cultivation requires a good deal of care and is, at present, in Sind, rather the work of cultivators who make a speciality of the crop. About half an acre of tobacco was grown in 1926, nearly all under local Sind tobacco, but a small area under an improved Gujarat type (Nadiad No. 6). The Sind tobacco grew well in the seed bed, and was transplanted on the sides of ridges between August 12th and 31st, 1926. After transplanting it flourished, being watered every ten days, receiving ten such waterings at 2 inches of water every irrigation. The total water given, after transplanting, was—

(1) By irrigation	..	20 inches.
(2) By rain	..	3 inches.
Total	..	23 inches.

A topdressing of 2 cwts. of Sulphate of Ammonia per acre was given in September 1926.

The crop was topped as usual and suckers removed regularly. It was cut on December 21st and cured by the local method. In February 1927 the cured leaf amounted to 1,500 lbs. per acre for which Rs. 13 per maund (of 84 lbs.) were offered, or a value of Rs. 232 per acre. It was, however, kept till June 1927 when the weight had gone down 996 lbs.

for which Rs. 17 per maund (of 84 lbs.) were offered or a value of Rs. 201-8-0 per acre.

In the small area devoted to Nadiad tobacco, it was obvious that this was much more delicate than the Sind product and requires much more care in management. The leaves were, however, large, and despite many gaps in the cultivation, it gave 1,000 lbs. of locally cured tobacco in June 1927. There is clearly a probable future for this tobacco in the barrage area,—especially if methods of curing similar to those in use in the Charotar (Gujarat) can be introduced.

Tur or Arhar.—Among other crops, not usual in Sind except to a limited extent in the Jamrao area, is *tur or arhar*, perhaps the most popular pulse crop in India. It was decided to test this as a *kharif* crop with controlled water and it was sown on August 7th, 1926, in two areas, one with Deccan *tur* and the other with the crop from Gujarat. Both of these flourished well and grew luxuriantly, being drilled on land which had already received a dressing of 4 inches of water. The total amount of water received by the crop was—

(1) By irrigation	20 inches.
(2) By rain	3 inches.
Total ..	23 inches.

The Gujarat *tur* flowered three weeks earlier than that from the Deccan, namely in the last week in November, while the latter only came into general flower after the middle of December. Locusts attacked the Gujarat crop in places near the end of October, but did not do very material damage. Frost however, occurred early in January and did serious harm, completely ruining the very luxuriant crop on the Gujarat tur which was fast ripening. The Deccan *tur* which had not developed so far, was also badly damaged, but not completely ruined. While in fact, the Gujarat tur gave no crop at all, the Deccan tur produced 534 lbs. of seed per acre, reaped in March 1927. This is small, of course, and represents only about one-third of what would have been obtained if frost had not occurred, judging from the luxuriance of growth and the amount of flower and pods.

The result shows that we have in *tur* a crop which is a very doubtful one, unless it can be made to ripen early. It flourishes exceedingly, but being very sensitive to frost is liable to be entirely lost on this account. It is clear in fact, that under Sind conditions a much more rapidly ripening type is needed than those grown in the Deccan or even in Gujarat. The search for such a type must be the next step with this crop.

Sann-Hemp.—One of the most vigorously growing crops in the Kharif season at Sakrand has been sann hemp, a crop now grown to a limited extent in the Bombay Presidency, in the Konkan, the Deccan and the Panch Mahals. If it can be grown well in Sind it may serve three purposes. First it may be a producer of fibre, which is analogous to, but superior to jute, then it may serve as a green manure and so enable land

to be recuperated and lastly it may serve to a limited extent as a very rapidly growing fodder.

In the present case, 80 lbs. of Gujarat sann hemp seed per acre was drilled at 12 inches distance between the rows on August 16th, 1926. It grew very vigorously from the start and was given water as follows :—

(1) By irrigation ..	..	13 inches.
(2) By rain	..	3 inches.
	Total ..	16 inches.

It was allowed to ripen and was reaped on December 6th, 1926. It gave 1,006 lbs. of seed per acre, and 195 lbs. of retted fibre. The fibre yield was small, but all the staff at Sakrand was new at the retting of it. In the meantime it has been shown and confirmed in the current season, that the crop flourishes exceedingly, is not damaged by any enemy except excess of salt in the land, and may serve several very useful purposes.

Other *kharif* crops which were grown in 1926, need only be referred to. *Til* (Sesamum) began well, but was very late and as is often the case in Sind, it became unhealthy and was attacked by aphis, and, like all the *til* in the districts round, the crop was lost. *Guar* (*Cyamopsis*) grew very luxuriantly, but did not set pods and was cut and used as fodder. As fodder it gave 10,400 lbs. per acre, with water as follows :—

(1) By irrigation ..	..	12 inches.
(2) By rain ..	..	3 inches.
	Total ..	15 inches.

This amount of fodder was obtained in nine weeks and represents a very important result. Sweet potato and groundnut were both planted in 1926 on land which turned out to be somewhat salt. But while it is not possible on this account to give crop yields, it became abundantly clear that both of them would flourish. Hence, they were again planted in 1927 on land known to be free from salt and have grown well and promise, as I write, to give first class crops.

Groundnut was in 1927 sown on the last week of June, and has grown well, particularly after the heavy rain which came a month later. Both 'Spanish Peanut' and 'Big Japan' are being grown, and have so far (September 6th) received water as follows :—

(1) By irrigation	..	18 inches.
(2) By rain ..	..	5½ inches.
	Total ..	23½ inches.

The former variety will require 6 inches more water before reaping, and there is every prospect of a yield of 2,000 lbs. of dry nuts per acre. So far the only serious enemies we have had are rats, which evidently highly appreciate the plants and the nuts. The crop is however one which is very sensitive to *Kalar* and must be grown on sweet soil. If so

grown, it promised to be at least as profitable as cotton as a *kharif* crop and will occupy the land a much shorter time.

As regards sweet potatoes, the creepers were planted out in good land, with 15 cartloads of farmyard manure per acre, on July 29th, 1927. It has done very well, and promises an excellent crop. It is expected to ripen in November. So far (September 6th) it has had water as follows :—

(1) By irrigation	.. ..	12 inches.
(2) By rain	.. ..	5½ inches.
	Total ..	17½ inches.

It will require about 12 inches more water before the crop is removed, making a total of 29½ inches.

I wish to refer to one more crop which is to be used partly as a fodder and partly as a pulse crop, namely cowpea or *chavli* (*Vigna catiang*), a crop very rarely seen in Sind except as a vegetable crop near big cities. In 1926, it was planted on July 23rd at the rate of 20 lbs. per acre on land somewhat salt, and gave a crop of green fodder amounting to 9,760 lbs. per acre (green) on September 20th, 1926, having used water as follows :—

(1) By irrigation	.. ..	16 inches.
(2) By rain	.. ..	3 inches.
	Total ..	19 inches.

A further crop could not be obtained in 1926 owing to the saltness of the land, for cowpea like most leguminous plants is sensitive to salt. In 1927, however, the crop was again sown in the last week of June, and a first cutting of fodder was obtained in the last week of August amounting to 9,484 lbs. per acre, having received water as follows :—

(1) By irrigation	8 inches.
(2) By rain	5 inches.
Total ..	13 inches.

A second cutting will be obtained in October and thereafter it will be allowed to go to seed. For this it will need ten more inches of water. There is little doubt that 15,000 lbs. green fodder will be obtained per acre, plus the seed. And, hence there seems a big future for this crop, especially if animal husbandry becomes a staple industry of the irrigated areas of Sind.

Rabi Crops of 1926-27

The *rabi* crop, par excellence, in Sind is wheat and this with other crops were laid out on new land, which had never been irrigated in the past, or at any rate for many years. Difficulties with the water supply drove the season late, but certain results have been obtained.

Wheat.—Under these circumstances wheat was planted, after tractor ploughing of the land, between December 11th and December 18th, 1926.

This was too late to get the best results. The amount of water added was kept as low as possible, in order to see on how little water a *rabi* crop on new dry land could be matured. The total water added was as follows :—

(1) Before planting	..	.. 4 inches.
(2) During growth (in three dressings)	..	.. 6 inches.
	Total	.. 10 inches.

There were 20 cents of rain in January but this may be ignored.

With this quantity of water, considerably below the Baker Lane allowance of 14 inches, an average crop of 1,100 lbs of grain per acre was reaped in the latter half of March. This included the following varieties :—

Phandani wheat (C. P. H. 47) from Upper Sind	..	1,281 lbs. per acre.
Awned wheat (G. I. 25)	..	1,200 lbs. per acre.
Thori wheat (D. I. 38)	..	1,033 lbs. per acre.
Punjab 11 wheat ..	..	1,033 lbs. per acre.
Pusa 12 wheat ..	..	792 lbs. per acre.

I do not pretend that these yields represent the capacity of the crop or the land. But they do show what can be done with fresh dry land, with a minimum quantity of water, even with wheat planted late, in Central Sind.

Successful crops of *rabi jambho* were grown on fresh dry land in six inches of water applied by irrigation, but these need no further comment. But the possibilities of land here, may better be indicated by the crops of *berseem* and onions we were able to obtain with definite amounts of water.

Berseem.—Berseem is an Egyptian crop which performs two functions,—the first being the improvement of land which has grown cotton or other crop in the previous season and the second the provision of an abundant and very valuable green fodder through the cold weather. It has a third purpose, which is very important with us here, namely to improve land somewhat salt, and make it fit for general cultivation.

The land on which this crop was grown was decidedly salt. Patches proving themselves bad contained 1·05 per cent. of total salts in the top six inches of soil. Where the crop flourished normally it contained 0·65 per cent. of total salts in the top six inches of soil. These trials were made after the crop had failed or flourished as the case may be.

This land received four inches of water and then the seed was broadcasted on the succeeding day in a further four inches of water, at the rate of 84 lbs. of seed per acre on November 21, 1926. This was double the normal amount and equal crops would have been obtained with half the amount. It flourished from the beginning, and a cutting of fodder was obtained on January 11th. Three cuttings were made in

all, on January 11th, February 11th and succeeding days, and the last from March 17th onwards. The crop was then left to see if seed would form. Only four cartloads of manure per acre were added before planting.

The total water given to this crop was—

(1) At planting	..	.. 8 inches.
(2) During growth	..	.. 28 inches.
	Total	.. 36 inches.

And the yield of green fodder obtained was—

1st cutting	..	4,896 lbs. per acre.
2nd cutting	..	7,440 lbs. per acre.
3rd cutting	..	10,620 lbs. per acre.
		22,956 lbs. per acre.

Its local value was six annas per maund (84 lbs.) to be cut by the purchaser—thus giving Rs. 102 per acre without the cost of reaping. As no seed was obtained, which seems to be always the case in Lower Sind, the ripened plants were collected and amounted to 2,250 lbs. per acre of inferior fodder.

This crop has a big future, if we can only grow the seed in India but this can only be done in Upper Sind or the Punjab. Seed does not and will not ripen in Lower or Central Sind.

I may say that the value of berseem as a crop for improving the soil has been well illustrated this year, for the *jowar* crop grown on these berseem plots in the kharif season of 1927 is excellent.

Onions.—Onions are really a garden crop grown in the rabi season, requiring much more water than is allowed under the Baker Lane scheme, but likely to flourish exceedingly in Central Sind if given a chance. At Sakrand, this was planted out on land manured with 15 cartloads of farmyard manure per acre from seed beds on January 15 to 17, 1927, into dry land which was immediately watered with 4 inches of water. The total water added between the planting and May 30th when the crop was reaped, was 24 inches. The crop of onions obtained was, on the average, 15,960 lbs. onions per acre, as sold ten days after taking out of the ground. The greater part of the crop was sold at Re. 1 per maund of 84 lbs., and the rest at twelve annas per maund bringing in Rs. 164-10-0 per acre. There was no difficulty with the crop whatever.

Potatoes.—Potatoes, though they flourished, were not so successful as onions, owing to a severe frost which damaged them at the beginning of January. Three types of potato seed were planted, as follows :—

(*a*) Early Italian Potatoes, planted on November 21st, 1926. This received 24 inches of water and was reaped on February 27th, 1927, giving 2,800 lbs. per acre. This crop was ruined by frost, but the potatoes obtained were marketable.

(*b*) Scottish "Philo" Potatoes, planted on December 8th, 1926. This received 26 inches of water and was reaped on March 25th, 1927, giving 5,872 lbs. per acre. This was not badly damaged by frost, and the quality of the produce was excellent.

The manure used for these potatoes was 30 cartloads of farmyard manure per acre, *plus* sulphate of ammonia at the rate of 56 lbs. per acre as a top dressing after the frost.

Neither of these crops could be counted as good, but the experience has been valuable, and the way the crops were damaged by hedgehogs and other animals has given us an idea as to what there is to fight against.

Perennial Crops

It remains to deal with preliminary results concerning two perennial crops whose future is very important in the barrage area, namely lucerne and sugarcane. The former of these seems to have not only great value as a means of reclaiming salt land, but yields very large quantities of fodder, the latter, sugarcane, has a big future if some of the new canes which have been of such very great importance in North India can be acclimatised and established in Sind.

Lucerne.—The land chosen for lucerne was all more or less salt. The sweeter portion was planted in rows on the flat: the more salt portion was sown between ridges in furrows in which water was allowed to flow. All was put in the last week of December 1926 and the first week of January 1927. It was anticipated that great difficulty would be found in establishing the crop, owing to salt, but the methods adopted were unexpectedly successful and except for a few limited patches, where there was actual salt efflorescence when the soil dried after irrigation, it is proved that lucerne can be used, even as a first crop on land fairly intensely infected with salt.

The seed was planted on the flat in dry soil, and was immediately treated with two inches of water, then one inch after five days, and thereafter two inches after ten days. In the area where lucerne was to be planted in furrows, the whole beds were first soaked with four inches of water, then ridges were made, seed was planted by hand in the furrows, and two inches of water given at once. After this the watering was the same as with the lucerne planted on flats.

The total water given in the two cases up to August 18th, 1927, was as follows:—

(1) Lucerne planted in beds .. 52 inches.
(2) Lucerne planted in furrows .. 50 inches.

This was in addition to 5½ inches of rain.

Cuttings commenced from March 2nd, and have continued since then on April 1st and thereafter at intervals of 21 days. Eight cuttings have been taken up to August 18th, and the crop reaped has been as follows:—

(1). Hyderabad Lucerne grown on the flat 32,811 lbs. per acre.
(2) Hyderabad Lucerne grown in furrows 20,394 lbs. per acre.
(3) Poona Lucerne grown on the flat 19,958 lbs. per acre.

To get this, ten cartloads of farmyard manure per acre were given before planting, and after the above cuttings have all been taken, another similar dressing is being given in September 1927.

The chief interest of this lucerne growing is the fact that a very valuable crop can be obtained on fresh land, known to be salt, immediately by the use of the furrow system, and that so far as we can see, when the lucerne has to be dug up in a year or two, the land will be in good condition for any crop whatever. This itself is a very important conclusion.

Sugarcane.—After a good deal of discussion, it was decided to try the cultivation of good varieties of sugarcane from North India at Sakrand, with a view to see how far they are suitable for Sind, and in particular how far they can replace the poor reed canes which (except in the neighbourhood of large towns for eating) are the only ones now cultivated in Sind. A number of the new Coimbatore and other canes were obtained from Shahjehanpur (U. P.) by the kindness of the Director of Agriculture, U P., and were received on February 9th. This is not the place to give details as to the method of cultivation adopted, as the crop is now only being grown. But at least one type of Coimbatore cane (Co. 213) shows great promise, and, to me at least, looks as if it could give high yields in the barrage area in Sind. I cannot say more at present, as it will not be reaped till the end of 1927. So far (February 9 to September 1st, 1927) it has 52 inches of water, in addition to 5½ inches of rain.

Improvement of Crops

While one of the primary purposes of the Sakrand station was to see what crops would grow well, and what varieties of these crops would grow best, under irrigation conditions as specified by the Baker-Lane scheme for working the post-barrage water supply, yet almost a matter of equal importance was the working out of specially suitable types of the staple crops for these conditions. In every crop the question arises. Cotton will grow, but what type of cotton will grow best under particular conditions? Wheat can be cultivated,—but will the types which have done best in the Punjab or North India generally, be equally the best under the conditions of Sind,—and so on. Thus it has become important especially where relatively new crops are being introduced in an area, (through not exclusively in such cases) to acclimatise, select and breed types specially suitable for the climate, soil and water arrangements present.

Work on these lines has been actually taken in hand at Sakrand with four of the chief crops to be grown, and on a small scale with a fifth, and it is necessary to give a very short account of the position with these crops.

Cotton.—Deshi cotton in Sind, though it has a market of its own, is very inferior, has a short staple, and is very rough. Its chief advantage from the grower's point of view is that in the special type worked out at Mirpurkhas by the Agricultural Department, known as "27 W. N." it yields highly and has a very high ginning percentage. Wherever the country has to depend on inundation canals, however,

this has been the sole cotton which could be grown with success, and it is the standard *deshi* cotton for Sind.

But the coming of canals which give a water supply for a longer period of the year, gives the chance to Egyptian and American cottons. The former were tried on the Jamrao canal in its earlier days but the varieties then grown proved too sensitive for Sind conditions and its cultivation was abandoned nearly twenty years ago. American cottons have had varying success. Seed of a type known as 'Triumph' was imported on a large scale, and had a success for a number of years, and then it was supposed to have deteriorated and has almost died out. Then Punjab American types were introduced, and the recent development of about 30,000 acres on the Jamrao Canal are almost entirely of the Punjab F. 4, a very medium staple, but very luxuriant American, and to a small extent of Punjab F. 285, a somewhat better but lower ginning type. Neither of these is, however, pure, and this always opens the possibility of deterioration.

Two things are, therefore, to be done at Sakrand. First we have to try a number of the Egyptian and American types and second we have to select from any of these which are promising, those strains which will give the largest crop of high ginning, good staple cotton.

For this reason, in the *Egyptian* types, we have imported five of the well known kinds of cotton seed,—Sakel, Pilion, Boss 111, Zagora, and Ashmouni, and tried to see how far each of them will flourish under the conditions of Central Sind, with, however, a guaranteed water supply. We have used these for nearly two years now, and I think I can say that with the exception of the last (Ashmouni) there is little chance for any of these Egyptian types in Central Sind. Whenever they are planted, whatever be the water supply, they have shown themselves too delicate for the conditions, which involve a far higher temperature during growth than that to which they are accustomed in Egypt. The last (Ashmouni) is in a different case. It comes, as is well known, from Upper Egypt, and though its quality is not equal to the best Egyptian, yet it promises to be healthy and flourish in Sakrand, and to form the basis, after further selection, for it is a mixed type, of an Egyptian cotton which can be successfully grown in Central Sind.

With regard to American cottons, one of the most disappointing series of experiments in the last few years has been the attempt to grow cotton seed directly imported from America in Western India. Everywhere plants from such seed have shown themselves, in most cases, unsuitable. They have not been vigorous, have yielded badly, and have become diseased, in all except a very few cases. And though about forty of the leading American types have been tried in Sind, only one of them is promising, and three others have possibilities of acclimatisation. The promising type is '*Acala*' and this flourishes luxuriantly and flowers well, giving a medium American cotton (just over 1 inch in staple); others which have possibilities are '*Durango, Hartsville*', and '*Delta Type Webber*' which are still under trial. These three, however, are

much more likely to become the basis of crosses with more luxuriant Punjab types than to have value on their own account.

The Punjab American cottons are in a different category. They grow luxuriantly and yield well,—but, as in 1926 they are liable to sudden, and, so far, unaccountable failures. The best among them, as far as luxuriance and yield is concerned,—the so called F.4,—is a low grade American cotton. Already improved strains have been isolated from these Punjab cottons, and either these themselves or crosses between them and the better class American cottons bid fair, I think, to become the standard American cottons for Sind in the future.

Wheat.—In determining and developing types of wheat suitable for Sind conditions two methods have been followed. Either the kinds of wheat more recently developed in North India have been imported and grown, or else selection has been started in the local 'Phandani' and 'Thori' types grown hitherto in Northern Sind and in awned wheats grown in Lower Sind. Both methods are proving successful in the great wheat growing areas and 'Pusa 12' wheat is now the standard type in Larkana, Sukkur, and Upper Sind Frontier. The selections made from 'Phandani' and 'Thori' are also proving a success in North Sind, and are giving 20 per cent. higher yield than the varieties from which they are selected.

Pusa 12, selected 'Phandani' (C.P.H.47), 'Thori' (A.T. 38), and awned (G.S. 25) wheats are the basis for the work at Sakrand, and the standards with which selections from wheats already locally grown or imported from elsewhere are to be compared. This comparison is now in hand, and already there are signs that it may be possible to get something even more suitable than any of these for what will be the enormous irrigated wheat area of Central Sind.

Jowar.—We have come to the conclusion that, in almost any of the staple crops of India, it is possible to increase the crop by 20 per cent. or thereabouts by selecting the best strains in any variety. Such selection is not an easy process and takes a long time. But success seems almost assured if the selection is done skilfully and precautions against later contamination are taken.

In the case of *jowar*, which is likely to be the largest staple *kharif* food crop in Central Sind in future, displacing *bajri* in many areas, we are in the fortunate position of having a fairly large and representative collection of Sind *jowars* grown for a number of years at the Larkana farm, and these are forming the basis of our further selection at Sakrand. The work is of the highest promise. We are able, already, to get an even high yielding crop, to isolate types suited to almost any conditions and, in two or three years, seed will, I think, be available which is specially suited for a considerable number of specified areas. I have rarely seen better *jowars* than those we have been able to grow from selected seed, at the Sakrand station.

Rice.—Though the area of rice in Central Sind will, under barrage conditions be limited, yet this crop will be one of the two largest staples

on the right bank canals, and will always be used where there is excess of water and where land has to be reclaimed from salt.

Improved types of rice, giving more than 20 per cent. improvement in yield over the local rices of the same class have been developed at Larkana for the rice area of that district of North Sind. These have been successfully introduced at Sakrand and form our standard of comparison with the further selections now being made from rice grown in Nawabshah in Lower Sind, elsewhere. This further selection is now being vigorously pushed.

Guar.—Perhaps the standard *kharif* leguminous crop useful as a fodder, as a vegetable, and as a grain crop, in the alluvial soil of Sind is *guar* (*Cyamopsis*) and it has, I feel, a big future. But the crop as grown is a mixture of many types, some of which, as far as we can judge from observations already made, are likely to give double the yield of others. These different types have never, so far as I am aware, been described separated and studied. This work is now in hand on a small scale at Sakrand, and has very great possibilities.

Effect of Irrigation on Soil

The introduction of perennial water,—or rather of water which can be available, if wanted, at any time of the year,—will have some effect on the soil to which it is applied. What will this effect be ? So far we can only judge from what has happened in other countries, but none of these are really comparable with the areas of Sind to which such water is to be introduced. Will it cause a very large development of salt in the land ? Will the land rapidly lose in fertility ? Will it be possible to clear the very large areas of salt land among the waste areas of Sind, and bring them under successful cultivation ? Is there danger of water-logging by the application of water as proposed under the barrage scheme ? These are questions which all those interested in Sind are asking, but to which there is as yet no reply, and cannot be any reply until several years of experiments have been carried out. Such experiments form one of the very large sections of the work at Sakrand and are already in hand in many directions.

Some of the lines of investigation may be noted, most of which demand accurate means of determining the water applied to the land, which it has never hitherto been possible to get.

1. Experiments are in hand to determine what is the penetration of different doses of water and their effect on the distribution of the salt which occurs in such a large proportion of the Sind soil. If the salt is washed down to a definite depth will it rise again if the soil becomes dry ? and what is the depth to which it must be washed to prevent the possibility of its rising again ?
2. Experiments are also in hand to determine the extent to which each of the probable staple Sind crops will stand salt of the composition usual in Sind, and so to determine the crops likely

to be most suitable at every stage of salt reclamation. This is important because it is becoming clear that the definitely salt areas in the waste lands of Sind,—and especially among the higher lands,—are far more numerous and greater in extent than is generally supposed.

3. Experiments are also in hand to see how far the subsoil water level will be affected by the type of irrigation proposed under the barrage arrangements. It will only be possible to get results slowly, but the matter is important.
4. Experiments are in hand too, to determine how, accepting the Baker-Lane scheme of water distribution as a basis, the water should be applied, to get the best results. Already for example, there is distinct evidence that for *jowar*, *guar* and cotton as *Kharif* crops, it is better (provided there is a thorough preliminary soaking of the land) to give larger dressings of water at longer intervals than smaller dressings at shorter intervals. But the work is only at the preliminary stage, and will demand both time and patience.
5. Experiments are already in hand to try one method at least by which salt can be rapidly either removed from land or rendered innocuous. This is by the use of Calcium Chloride and it appears to have some promise.
6. Experiments will shortly be in hand to determine the loss of fertility which takes place by continued cropping of the same land with the same or with different crop. Past experience in Sind (Mirpurkhas) is that wheat grown on the same land in successive *rabi* seasons, rapidly gave a very small yield. But this matter will now be tested on a larger scale and under bigger variety of conditions. Such cultivation, as is well known, causes loss of condition in the soil, and it is important to see how tilth can be maintained in these circumstances.

These are just a few of the sort of problems which we have in hand, and on whose solution the success of the post barrage cultivation largely depends. Time only can tell how far solutions can be worked out.

The use of Tractor Cultivation in Central Sind

Incidental to the inquiries which have been and are being made as recorded above, the question of the method of cultivation to be adopted on the huge areas which will come into use under the Sukkur barrage canals must be considered. It is quite clear that the cattle in Sind are not sufficient to cultivate the area, and if cattle are imported from the surrounding tracts of Rajputana, Baluchistan, etc., it will mean the devotion of a very large area to the growing of non-remunerative fodder crops. This is particularly the case, because the present fodder resources of Sind largely consist of wild trees and shrubs,—most notably the *kandi* (*Prosopis spicigera*) and the *babul* (*Acacia arabica*),—and when the barrage areas come under cultivation these will be largely removed and the present fodder supply very materially curtailed. The question, therefore, arises as to how far mechanical cultivation by motor or otherwise

can replace bullock power, and it is one which is obviously of very great importance, and one which will be investigated in detail at Sakrand. At present I can only present some provisional, but, I think, important results.

In the first place it must be remembered that neither in Sind or anywhere else can mechanical cultivation completely replace work by animal power. The best results obtained in the United States in areas where tractors are used to a greater extent than almost anywhere else, indicate that they may replace about 36 to 40 per cent. of the animal power on a farm, but not much more than this. That is to say that if a farm requires eight pairs of bullocks for its efficient working, this number can be reduced to five pairs if a tractor is used, but probably not to a much greater extent than this,—and this fact must be kept in mind in considering tractor cultivation as a means of dealing with the barrage area in Sind.

Secondly, the unit of cultivation must be large. It is no use trying to cultivate fields of one acre or less which are usual in almost all the irrigated areas of Sind—with a motor tractor. If they are to be cultivated in this manner, a number of such fields must be thrown together, bunds broken down, and the combined area cultivated as one field. Our experience at Sakrand seems to indicate that a field of four acres is about the smallest unit for economical cultivation.

Thirdly,—and this is important in Central Sind,—the land must be thoroughly cleared of woody jungle both above and below ground. Under the method of cultivation hitherto followed, where land is used for crops once in three years or more, it has never paid really to clear the jungle, which has been simply cut down when the time for cultivation arrived and allowed to grow again in the period between the years when the land is used. The result is that most of the areas consist of more or less scrub jungle above ground, but of a mass of thick interlacing roots underground, in patches, which cannot be removed by any known method of stump-pulling or burning, but which must be dug out laboriously by hand. At the Sakrand station the removal of such jungle and roots has cost Rs. 55 per acre and I doubt whether it can be done for less over very large areas in Central Sind. But the removal of the jungle and especially of these roots is necessary before the land can be properly developed, and especially before cultivation by motor can be undertaken. If it is not done, constant breakages of implements will be found for though there are certain implements on the market for ploughing land of very hard and bad character,—notably the so called brush-breaker,—yet even these implements will not face the opening up of land such as that under consideration in Central Sind, unless the greater part of such root jungle as I have described is first removed. Even after digging out the jungle, the probablity of breakages on account of such roots which may remain must be faced. In our own case at Sakrand, after spending Rs. 55 per acre for clearing the three-bottom plough used with the motor tractor broke down within a week of beginning the opening up of the land with it, causing a week's delay and the cost of replacing broken parts.

But, if these conditions be recognized, then there seems a very great field for the use of motor tractor ploughing in opening up new land in Sind, and in doing the very necessary dry ploughing to allow the soil to weather fully between crops. The experience at Sakrand, with a typical somewhat heavy silt soil in opening up new land, has been obtained with an 'International' 15/30 motor tractor working with (1) a three furrow, 12 inch mould board plough and (2) a four furrow, 24 inch disc plough.

In careful tests on opening new land conducted by Mr. R. M. Tambe, Assistant Agricultural Engineer in Sind, on units of not less than four acres the following results were obtained :—

I.—International tractor, 15/30 H.P. and three furrow, 12 mould board plough, ploughing 8 to 10 inches deep

(*a*) Total area ploughed—46 acres 27 gunthas.
(*b*) Total number of hours worked—66 hours 10 minutes.
(*c*) Cost of fuel, lubricants and sundries—Rs. 192-11-0.
(*d*) Drivers and Cooly wages for the days on which the tractor worked—Rs. 28-0-0.
(*e*) Actual cost of ploughing one acre—Rs. 4-9-7.

This cost does not include supervision, depreciation, interest and repairs. If these charges be put at 30 per cent. on the investment, per annum, the cost, including them, would be Rs. 6-5-4 per acre, on the understanding that the tractor and plough does four to five acres per day. In the above test 5·6 acres were done per day of eight working hours, but counting stoppages it is not safe to assume more than five acres per day of eight working hours.

II.—International tractor 15/30 H.P. and four furrow, 24 inch disc plough, ploughing 8 to 10 inches deep

(*a*) Total area ploughed—19 acres 30 gunthas.
(*b*) Total number of hours worked—48 hours.
(*c*) Cost of fuel, lubricants etc.—Rs. 99-1-0.
(*d*) Drivers and Cooly wages—Rs. 14-6-6.
(*e*) Cost of ploughing one acre—Rs. 5-12-0.

This implement—the disc plough—proved not nearly so efficient for opening up new land of the Central Sind type as the mould board plough, though it might be valuable for heavier and harder land. In the Sakrand land, it tended to sink and bury itself frequently, and so very much time was lost. Counting the same amount for depreciation, supervision, interest and repairs per acre as in the previous case the cost per acre opened up by ploughing in the manner described would be Rs.7-7-9.

These results are, of course, preliminary, but I record them because there is a demand for immediate information on the points discussed. The results would probably not be widely different with any modern efficient type of motor tractor.

Conclusions

I have endeavoured in this bulletin to give some idea of the agricultural conditions under which it is proposed to develop the land under the Sukkur barrage in Central Sind and of some of the problems which *must* be settled before the development takes place, if the best results are to be obtained and disasters avoided. The Sakrand Agricultural Research Station is intended to experiment in connection with these problems, with a view to having the information available when the barrage water becomes available. We have, in fact, established a station where the barrage conditions can be reproduced now, almost (though not quite) in their entirety, on land typical of enormous areas in the country, and a few of the preliminary results are here indicated. Time only can lead the clearing up of the problems set out in previous pages, but enough has been indicated to show that there is reason to suppose that before the barrage water becomes available in four or five years time it will be possible to determine how best the land should be opened out, what crops and rotations will give the best returns, how salt land can best be dealt with, what water will be needed by the crops grown and how best it can be applied, what varieties of each crop will give the best results, and how the land coming under the barrage can be protected from deterioration and from diminution in the returns. By its capacity to answer these questions before the development of the new irrigation in Sind, the success of the Sakrand Station will be judged.

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